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*Peter Gannett* THE  
American Tutor's Assistant;

OR,

A COMPENDIOUS SYSTEM

OF

PRACTICAL ARITHMETIC;

CONTAINING,

The several Rules of that useful Science,

*Concise, defined, methodically arranged, and fully exemplified.*

THE WHOLE

PARTICULARLY ADAPTED TO THE EASY AND REGULAR

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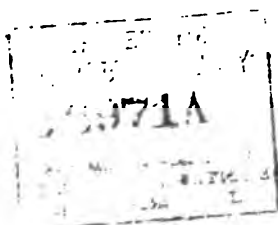
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## P R E F A C E.

THE following treatise of arithmetic was begun, and a considerable part of it written, several years ago, under the direction of a number of School-masters, long experienced in the tuition of youth; but a variety of other engagements having intervened, and necessarily employed their attention, the work has been much retarded. In the mean time, the compositions of several men, eminent in this branch of learning have been published; and notwithstanding those works have their respective merits, the authors of this compendium are of opinion, that it will be of considerable utility, if adopted by our American Tutors.

As the intention of this publication is particularly to promote the interest of the rising youth, great care has been taken to avoid the embarrassment of technical terms; to render the rules, &c. plain and concise, and to furnish them with a competent number of suitable examples, adapted to the trade and commerce of the United States.

The compilers have had recourse to the works of various authors on the subject; from whence they have taken the liberty of extracting such parts as were applicable to their purpose, and of abridging or enlarging as they thought necessary; and although they particularly endeavoured to have the work as accurate and complete as their plan and other circumstances would admit; yet as different parts of it were written and altered, at different times, and by different pens; if the style should not appear uniform; or if some errors have escaped notice; these it is hoped, the candid Observer will consider as incident to performances of this kind; therefore any friendly hints which may tend to correct or improve this edition, will be gratefully received by either of us, who subscribe by desire and on behalf of the Editors.

JOHN TODD,  
ZACHARIAH JESS,  
WILLIAM WARING,  
JEREMIAH PAUL.

# C O N T E N T S.

<b>N</b> UMERATION, Page 1	Double Rule of Three in V. F. 131
Addition of Integers, - 2	Decimal Fractions, - 132
Subtraction of Integers, - 5	Addition of Decimals, - 133
Multiplication of Integers, - 6	Subtraction of Decimals, - 134
Division of Integers, - 10	Multiplication of Decimals, 134
Compound Addition, - 13	Division of Decimals, - 135
Federal Money, - 16	Reduction of Decimals, - 137
Table of Coins, &c. - 17	Single Rule of Three in Deci. 141
Compound Subtraction, - 27	Double Rule of Three in De. 143
Compound Multiplication, - 35	Involution, - 144
Compound Division, - 41	Evolution, - 145
Reductio, - 47	The Square Root, - 146
Single Rule of Three, - 57	The Cube Root, - 148
Inverse Proportion, - 61	Roots of all powers, - 151
Double Rule of Three, - 66	Arithmetical Progression, - 152
Practice, - 71	Geometrical Progression, - 155
Tare and Trett, - 79	Simple Interest by Decimals, 157
Simple Interest, - 83	Compound Interest by Deci. 159
Insurance, Commission, &c. 89	Discount at Compound Interest, 162
Compound Interest, - 97	Annuities at Compound Rate 165
Rebate or Discount, - 98	Annuities, &c. in Reversion, 172
Equation, - 100	Perpetuities, - 175
Barter, - 101	Perpetuities in Reversion, - 177
Loss and Gain, - 103	Life Annuities, - 178
Fellowship, - 105	Alligation, - 182
Exchange, - 108	Single Position, - 187
Vulgar Fractions, - 116	Double Position, - 188
Reduction of Vul. Fractions, 117	Permutation & Combination, 191
Addition of Vul. Fractions, 124	Duodecimals, - 192
Subtraction of Vul. Fractions, 125	Addition of Duodecimals, 192
Multiplication of V. Fractions, 126	Subtraction of Duodecimals, 192
Division of Vul. Fractions, 127	Multiplication of Duodeci. - 193
Single Rule of Three in V. F. 128	Promiscuous Questions, 194

## Explanations of Characters.

<i>Signs.</i>	<i>Significations.</i>
=	equal; as $20s = £.1$
+	more; as, $6 + 2 = 8$
—	less; as, $8 - 2 = 6$
×	into, with, or multiplied by; as, $6 \times 2 = 12$
÷	by ( <i>i. e.</i> divided by) as, $6 \div 2 = 3$ ; or, $2)6(3$
:::	proportionally; as, $2 : 4 :: 6 : 12$
√ or <sup>2</sup> √	Square Root; as, <sup>2</sup> √ 64 = 8
<sup>3</sup> √	Cube Root; as, <sup>3</sup> √ 64 = 4
<sup>4</sup> √	Fourth Root; as, <sup>4</sup> √ 64 = 2, &c.
—	a Vinculum; denoting the several quantities over which it is drawn, to be considered jointly as a simple quantity.

# ARITHMETIC.

**A**RITHMETIC is the art of computing by numbers. It has five principal rules for its operations, viz. numeration, addition, subtraction, multiplication, and division.

## NUMERATION.

**N**UMERATION teaches to express numbers by figures, set down or named, and consists of two parts, viz.

*First,* The right placing of them.

*Second,* The true valuing of each figure in its proper place; both which are exhibited in the following

T A B L E.

Units	Tens	Hundreds	Thousands	Tens of Thousands	Hundreds of Thousands	Millions	Tens of Millions	Hundreds of Millions
1								
2	1							
3	2	1						
4	3	2	1					
5	4	3	2	1				
6	5	4	3	2	1			
7	6	5	4	3	2	1		
8	7	6	5	4	3	2	1	
9	8	7	6	5	4	3	2	1
One								
Twenty one.								
Three hundred and twenty-one.								
4 Thousand 321								
54 Thousand 321								
654 Thousand 321								
7 Million 654 Thousand 321								
87 Million 654 Thousand 321								
987 Million 654 Thousand 321								

The above table is comprised in the following:—

Units	Tens	Hundreds	Thousands	Tens of Thousands	Hundreds of Thousands	Millions	Tens of Millions	Hundreds of Millions
1								
2	1							
3	2	1						
4	3	2	1					
5	4	3	2	1				
6	5	4	3	2	1			
7	6	5	4	3	2	1		
8	7	6	5	4	3	2	1	
9	8	7	6	5	4	3	2	1
Thousands. Units.								
Millions.								

## Numeration.

Nine figures are sufficient to express any number in common practice: nevertheless, the following table may be thought necessary.

<i>Nonillions</i>	<i>Octillions</i>	<i>Septillions</i>	<i>Sextillions</i>	<i>Quintillions</i>
8 5 7 3 4 2,	1 6 2 4 8 6,	3 4 5 9 8 6,	4 3 7 9 1 6,	4 2 3 1 4 7,
<i>Quadrillions</i>	<i>Trillions</i>	<i>Billions</i>	<i>Millions</i>	<i>Units,</i>
2 4 8 0 1 6,	2 3 5 4 2 1,	2 6 1 7 3 4,	3 6 8 1 4 9,	6 2 3 1 3 7,

### EXAMPLES.

In figures express the following numbers:

One hundred and six.

Five hundred and thirty-eight.

Six thousand and seventy-four.

Twelve thousand, five hundred and ten.

Forty-five thousand, six hundred and one.

Two hundred and fifty-one thousand, six hundred.

Eight million, one hundred forty-two thousand, and six.

Sixty-five million, one hundred four thousand, and ninety.

Five hundred and two million, three hundred and four thousand.

Nine hundred forty-eight million, six hundred thirty-two thousand, seven hundred and fifty-one.

Numbers are also expressed by letters, and are called Numeral Letters, or Roman Numbers, thus:

1	2	3	4	5	6	7	8	9	10	20	30
I,	II,	III,	IV,	V,	VI,	VII,	VIII,	IX,	X,	XX,	XXX,
40	50	60	70	80	90	100	500	1000			
XL,	L,	LX,	LXX,	LXXX,	XC,	C,	D,	M,			

1803.

MDCCCIII.

A letter of less value, standing before one of greater, diminishes, but when placed after, increases, the value the greater. Hence, by combining the above letters, numbers are formed.

### ADDITION OF INTEGERS.

**A**DDITION of integers is the collecting of <sup>al</sup> numbers, of like signification, into one sum <sup>6</sup> and 8 make 14.

L.E.



R U L E.

Place units under units, tens under tens, &c. then begin at the right hand column and add upwards, set down the total if less than 10; if 10 or more, the right hand figure, and add the left to the next row of figures, which is carrying 1 for every 10; and so proceed to the last column, and there set down the whole of said column.

P R O O F.

Perform the addition downward; Or, Add the top line to the sum of all the rest; and if right, the total will be equal to the first.

E X A M P L E S.

271684	716087	47862178
728316	283913	52137822
643868	56786	67856321
356132	43214	32143679
786418	89675	68576814
548679	71648	34231861
<hr/>		
Total 3335097		
<hr/>		
67148914	86714827	62187654
32851086	57682186	786418
47189613	476829	646826
52810387	276836	34708
37186819	61783248	41682
62813181	27864	8328
71868716	4674	848
68189768	671218	4682
78964321	4168276	61783
67487689	67876368	27168271
53746938	78642176	47183
46957423	608924	98
<hr/>		
<hr/>		

*Application.*

Note. In this, and in some succeeding collections, the pupil may be directed to write the question on his slate with vacancies, in which the tutor may insert other numbers.

r Add 5856, 3840, 395, 265, 25, and three thousand, seven hundred and eighty-four together.

Facit 14165.  
2 A

2 A man was born in the year 1698, in what year will he be 99 years of age? *Answer in 1797.*

3 If a person have owing to him on bond 807*l.* in book accounts 1047*l.* in bills and notes 86*l.* and have in cash 478*l.* how much is the amount? *Answer 2418*l.**

4 Admit a bond to be 4687*l.* interest due thereon 178*l.* what is the amount? *Answer 4865*l.**

5 Suppose 5784 guineas in one purse, 588 in another, 84 in a third, and seven hundred and seventy nine in a fourth, what number is there in them all? *Answer 7235.*

6 Admit a boy had 357 nuts given him at one time, 127 at another, 78 at another, 378 at another, 57 at another; how many had he in all? *Answer 997.*

7 Suppose a person dying left his widow 3840*l.* to his eldest son 6850*l.* to two other sons each 2584*l.* to each of his three daughters 1685*l.* and in other legacies 950*l.* what is the sum of these bequests? *Answer 21863*l.**

8 A draper bought 10 bales of cloth, viz. N<sup>o</sup>. 1, 2, each 367 yards; N<sup>o</sup>. 3, 4, 5, each 407 yards; N<sup>o</sup>. 6, 7, 8, each 228 yards; N<sup>o</sup>. 9, 10, each 300 yards; how many yards in the whole purchase? *Answer 3239 yards.*

9 A grocer bought 8 casks of indigo, viz. N<sup>o</sup>. 1, 210*lb.* N<sup>o</sup>. 2, 196*lb.* N<sup>o</sup>. 3, 4, 5, each 205*lb.* N<sup>o</sup>. 6, 184*lb.* N<sup>o</sup>. 7, 125*lb.* N<sup>o</sup>. 8, 1274*lb.* how many *lbs.* in all? *Answer 2604*lb.**

10 A merchant bought 7 bales of cloth, in four of which were 52 pieces, which contained 1352 yards, the other 3 had 40 pieces, and contained 1098 yards; how many pieces and yards were there? *Answer 92 pieces, 2450 yards.*

11 If from the creation to the flood be 1650 years, from that to the calling of Abraham 427, from that to the building of the temple 909, thence to the founding of Rome 266, from that to the birth of Christ 752, and since to the present year 1803; how many years since the creation? *Answer 5807.*

12 How many strokes does a regular clock strike in a week? *Answer 1092.*

13 There are two numbers, the less is 9876, and their difference twice as many; what is the greater? *Answer 29628.*

14 Borrowed a sum of money: paid at sundry times 30*l.* 196*l.* 226*l.* 327*l.* and the remainder to pay is 162*l.* what was the sum borrowed? *Answer 1000*l.**

## SUBTRACTION OF INTEGERS.

**S**UBTRACTION of integers is the taking of a less number, called the subtrahend, from a greater, of the same signification, termed the minuend, and shews the remainder or difference.

## R U L E.

Put the less number under the greater, with units under units, tens under tens, &c. then begin at the right hand, and take the lower figure from that above it; but if it be greater than that above, take it from 10, and add the upper figure to that remainder, set down the result, and carry 1 to the next place; and so proceed.

## P R O O F.

Add the remainder to the less number, and the sum must equal the greater.—

Or, subtract the remainder from the greater number, and the difference will be equal to the less.

## E X A M P L E S.

From 4736985	9736214	18346152	74614328
Take 1514863	4878946	9804675	70840679
Rem. 3222122	4857268	8541477	3773649
Proof. 4736985	4878946	18346152	70840679

From 473648217	648271681	81621261	689081681
Take 97898604	48918692	198718	9908718
Rem.			

*Application.*

- 1 Borrowed 1090*l.* and paid 909*l.* how much remains?

*Answer* 181.

- 2 A man was born in the year 1698, what is his age in the year 1789?

*Answer* 91.

- 3 If from 101010 be taken 10101, and from the remainder 9099, what number will be left?

*Answer* 81810.



4 A boy who had one thousand nuts sold 286, gave away sixty, and lost 437; how many had he left? *Answer* 217.

5 There were four purses of money, containing 1*l*. 34*l*. 2*d*. 50*l*. 3*d*. 100*l*. 4*th*. 150*l* which were to be paid into the treasury; but, one of them being lost, only 234*l*. were paid; which was the purse lost? *Answer* 100*l*. purse.

6 Having a piece of ground 172 feet long, and rented to A at one end 57 feet, and to B 42 feet at the other end; how much was left between them? *Answer* 73 feet.

7 Bought of A two barrels of flour, each weighing 175*lb*. tare per barrel 15*lb*.—of B 3 ditto, each 183*lb*. tare per ditto 20*lb*.—of C 4 ditto, each 196*lb*. tare per ditto 17*lb* how many *lb*s. of flour neat? *Answer* 1525*lb*.

8 Suppose A had owing to him on bond 478*l*. and interest due thereon 98*l*. and received at two payments each 199*l*. how much is unpaid? *Answer* 178*l*.

9 A vintner bought 20 pipes of brandy containing 2459 gallons, and sold 14 pipes containing 1682 gallons; how many pipes and gallons were left?

*Answer* 6 pipes 777 gallons.

10 If the amount of a bond be 4700*l*. and payments be made of 1478*l*. 1319*l*. 826*l*. and 628*l*. how much remains unpaid? *Answer* 449*l*.

11 In four purses were different coins to the amount of 1000*l*. in the first was 109*l*. in the second 280*l*. in the third 217*l*. what was in the fourth? *Answer* 394*l*.

## MULTIPLICATION OF INTEGERS.

**M**ULTIPLICATION of integers is the rule for finding a number, equal to any other, taken any proposed number of times.

In which there are three parts, *viz.*

*First*, The *multiplicand*, or number to be multiplied.

*Second*, The *multiplier*, or number to multiply by.

*Third*, The *product* or number produced, which is equal to the multiplicand taken as often as there are units in the multiplier.

*Note.* The multiplier and multiplicand are also called *factors*, and the product is sometimes termed, *fact*, or *rectangle*.

T A B L E.

T A B L E.

1	2	3	4	5	6	7	8	9	10	11	12
2	4	6	8	10	12	14	16	18	20	22	24
3	6	9	12	15	18	21	24	27	30	33	36
4	8	12	16	20	24	28	32	36	40	44	48
5	10	15	20	25	30	35	40	45	50	55	60
6	12	18	24	30	36	42	48	54	60	66	72
7	14	21	28	35	42	49	56	63	70	77	84
8	16	24	32	40	48	56	64	72	80	88	96
9	18	27	36	45	54	63	72	81	90	99	108
10	20	30	40	50	60	70	80	90	100	110	120
11	22	33	44	55	66	77	88	99	110	121	132
12	24	36	48	60	72	84	96	108	120	132	144

C A S E 1.

When the multiplier does not exceed 12;

R U L E.

Place the multiplier under the multiplicand; multiply the several figures successively from right to left, carry the tens, and set down the overplus as in addition.

P R O O F.

Repeat the operation with the factors changed: Or, Multiply the double of one factor by half the other: Or, The product of the multiplicand by double the multiplier will equal the former product multiplied by 2.

E X A M P L E S.

Multiplicand 4513627    51473689    75134628    64132579  
Multiplier            2                    3                    4                    5

Product    9027254

83174268            41379462            74136982            80736014  
                  6                    7                    8                    9

9761436	47140651	273406152	96478362
10	11	12	12
_____	_____	_____	_____
_____	_____	_____	_____

## CASE 2.

When the multiplier is the exact product of two factors in the multiplication table ;

## RULE.

Multiply by one of said factors, and the product of that by the other ; the last product will be that required.

## EXAMPLES.

1 Multiply	5740632 by 32	Facit	183700224
2	3740016 by 56		209440896
3	7063115 by 96		678059040
4	7034652 by 144		1012989888

Note. When the multiplier exceeds 12, and is less than 20, multiply by the units figure, and add to the product of each figure that which is next on the right hand.

## EXAMPLES.

6782158	6874281	2816054
14	15	16
_____	_____	_____
94950212		
_____	_____	_____
5473682	4786824	6789863
17	18	19
_____	_____	_____
_____	_____	_____

## CASE 3.

When the multiplier consists of several figures ;

## RULE.

Make as many products as there are figures in the multiplier omitting ciphers, and place the first figure of each product exactly under its multiplier ; add the products together, and their sum will be the number sought.

If ciphers be in one or both factors at the right hand, annex them to the product.

## EXAMPLES.

EXAMPLES.

1	Mul.	7643827 by	23	Facit	175808021
2		8142630 by	75		610697250
3		9436170 by	920		8681276400
4		3760410 by	4840		18200384400
5		815036000 by	70300		572970308000000
6		1900460 by	161500		3069242900000
7		3800920 by	80750		3069242900000
8		6247386495 by	27356		170903504957220
9		12494772990 by	13678		170903504957220
10		47001881 by	1140090		53586374509290
11		94003762 by	570045		53586374509290
12		233926899 by	13679508		3200004886285692

Application.

1 Suppose 40 men were concerned in the payment of a debt, and each man paid 2564*l.* how much was the debt?

*Answer* 102560*l.*

2 How many square feet are in a floor 46 feet in length, and 35 in breadth?

*Answer* 1610.

3 If 9876 be multiplied by six thousand, seven hundred and eighty-nine, what is the product?

*Answer* 67048164.

4 Bought 342 bales of linen, in each bale 56 pieces, and in each piece 25 yards; how many pieces and yards were therein?

*Answer* 19152 pieces, 478800 yards.

5 A merchant bought 7 bales of cloth, in each bale 11 pieces, and in each piece 29 yards; how many pieces and yards were there?

*Answer* 77 pieces, 2233 yards.

6 Sold 8 bales of linen, in 4 of which were 9 pieces each, and in each piece 27 yards; in the other 4 were 12 pieces each, and in each piece 31 yards; how many pieces and yards were there?

*Answer* 84 pieces, 2460 yards.

7 A linen draper bought 10 bales of cloth, viz No. 1, 2, each 367 yards; No. 3, 4, 5, each 407 yards; No. 6, 7, 8, each 228 yards; No. 9, 10, each 300 yards; how many yards in all?

*Answer* 3239.

8 What is the product of twice five and twenty, by twice 25?

*Answer* 1500.

9 What is the product of 13578 multiplied by 4938?

*Answer* 67048164  
10 Admit



*Multiplication of Integers.*

10 Admit an orchard consisting of 126 trees one way 109 the other, and 1007 apples on each tree; how many trees and apples are in said orchard?

*Answer* 13734 trees, 13830138 apples.

11 A certain island contains 52 counties, each county 42 parishes, each parish 246 houses, and each house 10 persons; how many parishes, houses and persons are in the island?

*Answer* 2184 parishes, 537264 houses, 5372640 persons.

12 There are two numbers, the greater of them is 73 times 109, and their difference 17 times 28, what is their product?

*Answer* 59526317.

## DIVISION OF INTEGERS.

**D**IVISION of integers is the reverse of multiplication, and shews how often one number is contained in another. It consists of four parts, *viz.*

*First.* The *dividend* or number to be divided.

*Second.* The *divisor* or number to divide by.

*Third.* The *quotient* or number sought.

*Fourth.* The *remainder* (if any) which must be less than the divisor, and of the same name with the dividend.

Simple division is of two kinds, *viz.* short and long.

## SHORT DIVISION.

Short division is that in which the divisor does not exceed twelve.

## RULE.

Seek how often the divisor is contained in the first figure or figures of the dividend, under which set the result; if any remain, conceive it to be prefixed to the next figure, seek how often the divisor is contained therein, and so proceed.

## PROOF.

Multiply the quotient by the divisor, adding in the remained, if any, and the product will be the dividend.

E X A M-

EXAMPLES.

Divisor	2)7346286	3)5112896	4)37612285
Quotient	3673143 2	1704298 2 3	
Proof	7346286	5112896	
	5)97036142	6)74830956	7)91430682
	8)37846210	9)73004881	10)47390172
	11)41036294	12)64381259	12)59436828

Note. 1. When the divisor is the exact product of some two factors in the multiplication table, first divide by one of them, and that quotient by the other.

2. Multiply the first divisor into the last remainder, if any, and to that product add the first remainder for the true one.

EXAMPLES.

1	Divide 7463521 by 18	Facit 414640	1 Remainder.
2	73681090 by 48	1535022	34
3	740043612 by 96	7708787	60
4	57384659 by 144	398504	83

LONG DIVISION.

Long division is that wherein the divisor exceeds 12.

RULE.

Take, for the first dividual, as many only of the first figures of the dividend as will contain the divisor; try how often the divisor may be had therein; and set the resulting figure for the first of the quotient; subtract the product of this

this figure into the divisor from the dividend, and the remainder, with the next figure of the dividend, annexed, will be the second dividend. with which proceed as before, &c. till the dividend figures are exhausted.

## P R O O F.

As in short division.—Or thus: the dividend, less the remainder, divided by the quotient, will quote the divisor: Or the dividend, less the remainder, doubled, and divided by twice the divisor, will give the same quotient.

## E X A M P L E S.

	Dividend	
Divisor 41	94979	2316 Quotient
	82	41
	<hr/>	<hr/>
	129	2319
	123	9266
	<hr/>	<hr/>
	67	94979 Proof
	41	<hr/>
	<hr/>	
	269	
	246	
	<hr/>	
	Remainder 23	

			Quotient.	Rem.
2	Divide 7461389 by	95	Facit 78540	89
3	5374608 by	671	8009	569
4	9736205 by	2507	3883	1524
5	756390289 by	41659	18156	29485
6	9871369542 by	87648	112625	13542
7	19742712000 by	175296	112625	
8 }	139736422224 by	476838	293048	
9 }		293048	476838	
10 }	279472844448 by	586096	476838	
11 }		476838	586096	
12	2011527857382426 by	47821632	42063093	

Note. If one or more ciphers be on the right of the divisor, omit them in the operation, separating from the right of the dividend as many figures, which annex to the remainder.

E X A M P L E S.

EXAMPLES.

- 1 Divi. 8317642500 by 814600 *Facit* 10210, *re.* 576500
- 2 16034132000 by 1629200 10210
- 3 87521885000 by 12749000 6865
- 4 35008750000 by 27460000 12749

Application.

1 A person intending to go a journey of 3264 miles, would perform it in 136 days, how many miles must he travel each day? *Answer* 24

2 Several boys went to gather nuts, and collected 4275, which, when shared among them, each had 855; how many boys were in Company? *Answer* 5

3 If the expence of erecting a bridge be 5022*l.* to be defrayed equally by 186 persons; how much must be the quota of each? *Answer* 27*l.*

4 The quotient of an operation in division is 1763, the dividend 8435955; query the divisor? *Answer* 4785.

5 What number is that, which being multiplied by 7969, the product will be 1864746? *Answer* 234

6 Being desirous to plant 2072 apple trees in 14 rows, how many will be in each row? *Answer* 148.

7 In 670320 yards, how many pieces and bales allowing 35 yards in each piece, and 56 pieces in each bale? *Answer* 19152, pieces 342 bales.

8 If a cistern containing 15072 gallons, be emptied in 4 hours, by 48 equal vents; what quantity is discharged by either adjutage in that time? also how much per hour, admitting the velocity of the fluid to be uniform?

*Answer* 314 gallons, at the rate of  $78\frac{1}{2}$  per hour.

COMPOUND ADDITION.

**C**OMPOUND addition teaches to add several sums or quantities together of divers denominations, but of the same quality, as money, weights, measures, &c.

GENERAL RULE.

Place the numbers so, that those of the same denomination may stand directly under each other.

B

The



Then begin at the righthand column, and add up as in integers; divide the total by as many of that denomination as will make one of the next greater, set down the remainder (if any) under said column, and carry the quotient to the next, &c.

PROOF. As in integers.

### MONEY.

The denominations are :

4 farthings (marked *qr.*) make 1 penny, marked *d.*  
 12 pence " " — 1 shilling, " *s.*  
 20 shillings " " — 1 pound, " *£.*

Note. The shillings may be added as integers, carrying half the number of tens to the pounds, and prefixing the odd ten (if any) to the units under shillings.

#### PENCE TABLE.

<i>d.</i>		<i>s.</i>	<i>d.</i>
20 pence	make	1	8
30	-	2	6
40	-	3	4
50	-	4	2
60	-	5	0
70	-	5	10
80	-	6	8
90	-	7	6
100	-	8	4
110	-	9	2
120	-	10	0
240	-	20	0

#### TABLE OF SHILLINGS.

<i>s.</i>		<i>l.</i>	<i>s.</i>
20 shillings	make	1	0
30	-	1	10
40	-	2	0
50	-	2	10
60	-	3	0
70	-	3	10
80	-	4	0
90	-	4	10
100	-	5	0
110	-	5	10
120	-	6	0
130	-	6	10

### EXAMPLES.

<i>£.</i>	<i>s.</i>	<i>d.</i>	<i>£.</i>	<i>s.</i>	<i>d.</i>	<i>£.</i>	<i>s.</i>	<i>d.</i>
487	13	8	6785	14	9	4761	13	5
512	6	4	3214	5	3	5238	6	7
671	11	3	7485	19	11	6321	11	4
764	18	10	6471	13	6	3678	8	8

Total 2436 10 1

£.	s.	d.	£.	s.	d.	£.	s.	d.
7416	16	10	4671	13	4 $\frac{1}{4}$	8625	18	7 $\frac{1}{2}$
2583		2	5328	6	7 $\frac{3}{4}$	1374	1	4 $\frac{1}{2}$
8764	1	8	6785	11	8 $\frac{1}{2}$	6715	12	8 $\frac{1}{4}$
1235	7	4	3214	8	3 $\frac{1}{2}$	3284	7	3 $\frac{1}{4}$
7589	9	3	7156	14	9 $\frac{1}{4}$	6789	13	6 $\frac{1}{2}$
2410	10	9	2843	5	2 $\frac{1}{2}$	3210	6	5 $\frac{1}{4}$
8768	18	11	7890	14	6 $\frac{1}{4}$	8764	14	11 $\frac{1}{2}$
4682	19	4	4747	19	8 $\frac{1}{2}$	1867	17	6

£.	s.	d.	£.	s.	d.	£.	s.	d.
4716	12	4	1489	17	3 $\frac{1}{4}$	4	19	8 $\frac{1}{2}$
6784	19	11 $\frac{1}{4}$	871	18	6	8176	19	1 $\frac{1}{4}$
74	8	6 $\frac{1}{2}$	79	12	11 $\frac{1}{4}$	86	14	6
679	13	6 $\frac{1}{4}$	86	14	6 $\frac{1}{4}$	1486	5	3 $\frac{1}{4}$
8	14	7 $\frac{1}{2}$	4	19	8 $\frac{1}{2}$	6814	7	10 $\frac{1}{4}$
7681	12	11	91	17	6	79	12	11 $\frac{1}{2}$
5418	19	6 $\frac{1}{2}$	8176	19	11 $\frac{1}{4}$	2468	18	5 $\frac{1}{4}$
84	11	7 $\frac{1}{4}$	7189	14	8 $\frac{1}{4}$	5418	19	6
6	9	4 $\frac{1}{2}$	6814	7	10 $\frac{1}{4}$	47	3	10 $\frac{1}{2}$
2468	19	5	91	19	11 $\frac{1}{4}$	319	11	7 $\frac{1}{2}$

## Application.

1 Suppose a merchant, on settling his accounts, finds he owes A, seventy-four pounds, seventeen shillings and six-pence; B, six hundred twenty-seven pounds, six shillings; C, eight hundred forty-seven pounds, eighteen shillings and four pence three farthings; D. 564l. How much does he owe in all?

£.	s.	d.
A,	74	17 6
B,	627	6 0
C,	847	18 4 $\frac{1}{2}$
D,	564	0 0

2 If A have owing to him on bond 1908l. 17s. 10 $\frac{1}{2}$ d. and interest due thereon 191l. 2s. 10 $\frac{1}{2}$ d. How much is the amount?

Answer 2100l.  
3 Suppose

2 Suppose a vintner bought 40 tons of wine for 68*l.* loading and unloading stood him in 17*l.* 13*s.* 8*d.*  $\frac{1}{2}$ ; storage 8*l.* 10*s.* custom 16*l.* 13*s.* 9*d.*  $\frac{1}{2}$ ; land carriage 19*l.* 14*s.* 6*d.*  $\frac{1}{2}$ ; How much do the cost and charges amount to?

*Answer* 7*l.* 12*s.* 0*d.*  $\frac{1}{2}$ .

3 Admit a person left his widow the use of 6456*l.* for charitable purposes 297*l.* 14*s.* 8*d.* gave three nephews, 1546*l.* 14*s.* 8*d.* three nieces, each 1324*l.* and to his son 304*l.* 0*s.* 11*d.* What is the sum of these several bequests?

*Answer* 15649*l.* 19*s.* 7*d.*

5 Suppose a man borrowed a sum of money, and paid in part at one time 13*l.* 8*s.* 9*d.* at another 23*l.* 18*s.* 4*d.*  $\frac{1}{2}$ ; at a third time 47*l.* 0*s.* 9*d.* and the remainder is 37*l.* 14*s.* 6*d.*  $\frac{1}{2}$ ; what was the sum borrowed?

*Answer* 122*l.* 12*s.* 5*d.*  $\frac{1}{2}$ .

6 Bought 3 horses for 16*l.* 17*s.* 4*d.* each, and two cows for 5*l.* 14*s.* 7*d.* each, and three bushels of wheat for 18*s.* 10*d.*  $\frac{1}{2}$ ; what is the amount?

*Answer* 63*l.* 0*s.* 0*d.*  $\frac{1}{2}$ .

7 Admit a citizen going into the country ordered payment of the following bills, *viz.* the brewer's 42*l.* 3*s.* 3*d.* the butcher's 212*l.* 0*s.* 6*d.* the baker's 24*l.* the tallow chandler's 13*l.* 8*s.* the taylor's 137*l.* 9*s.* 9*d.* the draper's 74*l.* 13*s.* 6*d.* his rent 50*l.* servants wages 46*l.* 5*s.* and he would take with him 100*l.* for what sum must he draw on his banker to defray these expences?

*Answer* 700*l.*

8 Suppose A owes B 109*l.* 19*s.* 11*d.*  $\frac{1}{2}$ , C owes him twice as much, and D as much as them both; what is the total due to B?

*Answer* 659*l.* 19*s.* 10*d.*  $\frac{1}{2}$ .

## FEDERAL MONEY.

The denominations are:

10 mills ( <i>m.</i> )	make	1 cent,	<i>c.</i>
10 cents	-	1 dime,	<i>d.</i>
10 dimes	-	1 Dollar,	<i>D.</i>
10 dollars	-	1 Eagle,	<i>E.</i>

*The Standard Weight.*

		<i>dwt.</i>	<i>gr.</i>	
A Dime,	-	1	16 $\frac{2}{3}$	Silver.
A Dollar,	-	17	1 $\frac{1}{2}$	
An Half Eagle,	5	14 $\frac{1}{2}$		Gold.
An Eagle,	-	11	4 $\frac{3}{4}$	

The Federal standard, for gold and silver, is 11 parts fine and 1 alloy.

A TABLE.

# Federal Money.

19

Name of Coin.	Standard Weight.	Sterling Money of Great Britain.		New Hampshire, Massachusetts, Rhode Island, Connecticut, and Virginia.		New York and North Carolina.		New Jersey, Pennsylvania, Delaware, and Maryland.		South Carolina and Georgia.		Federal value.					
		£.	s. d.	£.	s. d.	£.	s. d.	£.	s. d.	£.	s. d.	E. D. c. m.	Dollars.	Cents.	Mills.		
(Gold.)	duet. gr.																
A Johannes, -	18 0 3	12	0	4	16	6	8	6	0	4	0	1	6	0			
An Half Johannes,	9 0 1	16	0	2	8	3	4	0	3	2	0	8	0				
A Doubleloon, -	16 21 3	6	0	4	8	5	6	5	12	6	3	10	0	1	4	9	
A moidore,	6 18 1	7	0	4	16	2	8	0	2	5	0	1	8	0			
An English Guinea,	5 6 1	1	0	1	8	1	17	0	1	15	0	1	1	9			
A French Guinea,	5 5 1	1	0	1	7	6	1	16	0	1	14	6	1	1	9		
A Spanish Pistole,	4 6 0	16	6	1	2	0	1	9	0	1	1	1	9				
A French Pistole,	4 4 0	16	0	1	2	0	1	8	0	1	0	17	6				
(SILVER.)																	
An English or French Crown,	19 0 0	5	0	0	6	8	0	8	9	0	8	3	0	5	0		
The Dollar of Spain, Sweden, or Denmark,	17 6 0	4	6	0	6	0	0	8	0	0	7	6	0	4	8		
An English Shilling,	3 18 0	1	0	0	1	4	0	1	9	0	1	8	0	1	0		
A Pistareen, . .	3 11 0	0	10 3	0	1	2	0	1	7	0	1	6	0	0	11		

All other gold coins, of equal fineness, at 89 cents, *per dwt.*, and silver at 111 cents, *per oz.*

Weight and Value of Coins as they pass in the respective States of the Union, with their Sterling and Federal value.

All other gold coins, of equal fineness, at 89 cents, per duet, and silver at 111 cents, per oz.

right and Value of Coins as they pass in the respective States of the Union, with their Sterling and Federal value.

A TABLE of other foreign Coins, &c. with their value in Federal Money, as established by a late act of Congress.

	E. D. d. c. m.		E. D. d. c. m.
Pound Sterling	0 4, 4 4	Rupee of Bengal	0 0, 5 5 5
Pound of Ireland,	0 4, 1 0	the Guilders of the Uni-	
Pagoda of India,	0 1, 9 4	ted Netherlands,	0 0, 3 9 0
Tale of China	0 1, 4 8	Mark Banco of Hamburg,	0 0, 3 3 5
Mill rees of Portugal,	0 1, 2 4	Livre Turnois of France,	0 0, 1 8 5
Ruble of Russia,	0 0, 6 6	Real plate of Spain,	0 0, 1 0 0

## EXAMPLES.

<i>E. D. d. c. m.</i>	<i>Dol. Cents.</i>	<i>E. D. d. c. m.</i>
7 4, 3 8 6	123, 47	57 5, 5 4 3
2 5, 6 1 4	876, 53	42 4, 4 5 7
5 4, 3 2 1	28, 02	9 4, 0 5
4 5, 6 7 9	71, 98	5, 6 5
3 4, 5 6 7	9, 09	, 0 6 3
8 9, 0 1 2	, 91	5 8, 0 3 7
<hr/> 32 3, 5 7 9 <hr/>	<hr/>	<hr/>

Note. In writing down any number of cents less than 10, a cipher must be prefixed in the place of dimes.—The figure next to the separating point on the left hand is dollars, and all to the left of that, eagles; but eagles and dollars may be read together as dollars; dimes and cents, a-cents; likewise cents and mills, or dimes cents and mills, enumerated mills: thus; 323, 579 may be read 323 dol. 57 cents, and 9 mills, or 323 dol. 579 mills, &c.

*Application.*

1 Laid out at sundry times viz. at one time 100 dollars, at another 75 cents, at a third, 4 dollars 7 mills, and lastly, 19 dollars 4 cents; query the whole expenditure?

*Answer* 123 D. 797m.

2 How much Federal money equals 1 English guinea, 2 French crowns, and 3 Spanish pistoles? *Answer* 18 D. 206m.

## TROY WEIGHT.

By this weight, jewels, gold, silver and liquors are weighed.

The denominations are :

24 grains ( <i>grs.</i> )	make	1 pennyweight, marked, <i>dwt.</i>
20 pennyweights		1 ounce, . - . <i>oz.</i>
12 ounces	-	1 pound, . - . <i>lb.</i>

## EXAMPLES.

<i>lb. oz. dwt. gr.</i>	<i>lb. oz. dwt. gr.</i>	<i>lb. oz. dwt. gr.</i>
7 10 11 15	21 4 13 16	33 7 10 13
2 1 8 9	78 7 6 8	165 10 4 17
4 6 7 12	36 5 10 14	48 6 12 23
5 5 12 12	63 6 9 10	276 3 13 5
11 13 14	78 9 18 23	53 8 9 19
10 19 23	67 10 19 21	327 11 19 4
<hr/>	<hr/>	<hr/>

## Application.

1 What is the sum of 36 pounds, 7 ounces, 16 penny-weights; 48 pounds, 7 ounces, sixteen grains, and 56lb. 6oz.

*Answer* 141lb. 8oz. 16dwt. 16gr.

2 A goldsmith bought 7 ingots of silver, three of which weighed each 9lb. 7oz. 14dwt. and each of the rest 8lb. 5oz. 15dwt. 16gr. how much did the whole weigh?

*Answer* 62lb. 10oz. 4dwt. 16gr.

3 Admit a goldsmith has 4 tankards weighing each 7oz. 18dwt. spoons weighing 4lb 6oz. 3 salvers each 6lb 4oz, what is the weight of the whole?

*Answer* 26lb 10oz. 12dwt.

4 Suppose a silver Smith sold 14 dishes weighing 18lb. 3oz. 14dwt. 36 plates weighing 48lb. 10oz. 15dwt. 6 salts weighing 5lb. 7oz. 4 salvers, 11lb. 10oz. 12dwt. Required the weight of the whole?

*Answer* 83lb. 11oz. 1dwt.

5 Bought 3 pair of sleeve buttons, each weighing 11grs. 2 basons weighing 1lb 5oz. 4dwt 14grs and two pair of buckles each 2oz. 11dwt. how much do they weigh together?

*Answer* 1lb. 10oz. 7dwt. 23grs.

6 Sold several dishes weighing 11lb 4oz 16dwt. 11grs. plates weighing 3 times as much; salts 2lb 5oz. 6dwt. 14grs. tankards 6lb. 7oz. 14dwt. 17grs. what is the weight of the whole?

*Answer* 54lb. 8oz. 7dwt 3grs.

## A VOIR DU POIS-WEIGHT.

By this weight are weighed things of a coarse, drossy nature, that are bought and sold by weight; and all metals but silver and gold.

The denominations are:

16 drams ( <i>dr.</i> ) make	1 ounce	-	-	oz.
16 ounces - -	1 pound	-	-	lb.
28 pounds - -	1 quarter of an <i>C. wt.</i>	-	-	gr.
4 quarters or 112lbs.	1 hundred-weight	-	-	<i>C. wt.</i>
20 hundred-weight -	1 ton	-	-	<i>T.</i>

Note 1. By the above table it appears, that 112 pounds make 1 *C. wt.* which are only given in some particular things; and from the best account ascertained at present, such are, all sugars (except loaf), rice, allum, brimstone, copperas, flour, oat meal, cocoa, race ginger, chalk, logwood, redwood, hay, iron, lead madder, &c. other articles, such as meat, cheese, butter, &c. likewise in Carolina rice, five score pounds are only given to the hundred.

2 Some things are bought and sold by the dozen, gross, &c. Hence.

12 particulars make	-	-	1 dozen,	-	doz.
12 dozen	-	-	1 common gross,	-	gro.
12 common gross, or 144 doz.	-	-	1 great gross,	-	g. gro.
20 particulars,	-	-	1 score	-	scor.

### EXAMPLES.

T. C.	qr.	lb.	C.	qr.	lb.	oz.	dr.	C.	qr.	lb.	oz.	dr.	
17	11	2	18	21	2	17	11	10	33	3	27	12	9
82	8	1	10	78	1	10	4	6	25	0	15	10	7
63	9	3	20	67	3	21	8	9	67	1	8	6	14
36	10	0	8	32	0	6	7	7	39	2	5	8	13
48	11	2	19	48	3	27	11	15	70	2	12	15	10
61	13	3	27	89	1	18	15	12	53	1	14	13	5

### Application.

1 Suppose a merchant bought 3 hogfheads of sugar weighing as follow, viz. N<sup>o</sup>. 1, nine hundred two quarters, eighteen pounds; N<sup>o</sup>. 2, 8 hundred, 3 quarters, 12 pounds; N<sup>o</sup>. 3, 7 hundred, 2 quarters, 19 pounds; how much is the amount?

*Answer* 26C. 0qr. 21lb.

2 In 4 boxes of spice weighing as follow, viz. N<sup>o</sup>. 1, one quarter, nineteen pounds, fourteen ounces, twelve drams; N<sup>o</sup>. 2, two quarters, one pound, eleven ounces, ten drams; N<sup>o</sup>. 3, 2 hundred, 2 quarters, 11 pounds, 14 ounces, 10 drams; N<sup>o</sup>. 4, 3 quarters, 6 pounds, 9 ounces, 15 drams; what do they amount to?

*Answer* 4C. 1qr. 12lb. 2oz. 15dr.

3 How much is the weight of 5 casks of flour weighing as follow, viz. N<sup>o</sup>. 1, 3C 2qr. 18lb N<sup>o</sup>. 2, 2C. 3qr 12lb. N<sup>o</sup>. 3, 1C 3qr 19lb. No. 4, 3C. 3qr. 7lb. No. 5, 2C 1qr. 18lb.

*Answer* 14C. 2qr. 18lb.

4 Bought 6 bags of hops weighing and numbered as follow viz. No. 1, 2C 2qr. No. 2, 2C. 1qr. 16lb. No. 3, 2C. 0qr. 3lb. No. 4, 2C. 3qr. No. 5, 2C. 1qr. 12lb. No. 6, 2C. 1qr 16lb. required the amount?

*Answer* 14C. 1qr. 19lb.

5 Suppose a merchant bought 3 hogfheads of rice, one of which weighs 12C. 3qr. 17lb. the other two each 11C. 0qr. 14lb. also 3 hogfheads of tobacco, each weighing 7C. 3qr. 17lb. what weight has he to pay carriage for?

*Answer* 58C. 3qr. 12lb.

6 What.

## Compound Addition.

21

6 What quantity of hops is there in 6 bags, the first weighing 2qr. 15lb. and each of the rest 10lb. more?

*Answer* 4C. 1qr.

## APOTHECARIES-WEIGHT.

By this weight apothecaries mix their medicines; but buy and sell by avoirdupois-weight.

The denominations are :

20 grains (gr.)	make	1 scruple,	℥
3 scruples	-	1 dram,	ʒ
8 drams	-	1 ounce	℥
12 ounces	-	1 pound.	lb

### E X A M P L E S.

lb	℥	ʒ	℥	gr.	lb	℥	ʒ	℥	gr.
6	7	4	1	11	23	10	6	2	13
3	4	3	1	9	76	1	1	0	7
8	9	2	2	14	61	8	4	1	11
1	2	5	0	6	38	3	3	1	9
8	11	7	2	19	47	7	6	2	17
6	10	4	1	13	28	11	7	2	19

### Application.

If a druggist mix several simples together; 1st. 3 ounces, 4 drams, 1 scruple; 2d. 4 ounces, 3 drams, 2 scruples; 3d. 4 drams, 18 grains; 4th. 6 ounces, 5 drams, 2 scruples, 18 grains; how much do they all weigh?

*Answer* 15℥ 23 0℥ 16gr.

## LONG-MEASURE.

Long-Measure is used for lengths or distances.

The denominations are :

3	barley-corns	(b. c.)	make	1 inch,	-	-	-	in.
12	inches	-	-	1 foot,	-	-	-	ft.
3	feet	-	-	1 yard,	-	-	-	yd.
5½	yards	-	-	1 rod, pole, or perch,	-	-	-	P.
40	poles (or 220 yds.)	-	-	1 furlong,	-	-	-	fur.
8	furlongs (or 1760 yds)	-	-	1 mile,	-	-	-	M.
3	miles	-	-	1 league,	-	-	-	L.
60	geographic	} miles	1 degree	-	-	-	-	de
69½	statute			-	-	-	-	

360 Degrees the circumference of the earth.

Not



## Compound Addition.

Note. A hand is a measure of 4 inches, and particularly applied to measuring the heights of horses; and the fathom of 6 feet, to the depth of water.

## EXAMPLES.

Deg.	M.	fur.	P.	Yds.	ft.	in.	b.c.
4	41	3	21	126	2	6	1
5	18	4	19	873	1	5	2
6	37	2	22	783	1	4	2
3	22	5	18	2	6	1	7
8	59	7	35	785	2	10	2
4	51	6	39	671	2	11	2

## Application.

If from Philadelphia to the sign of the blue ball be 20 miles, 3 furlongs, 30 perches; from thence to the red lion 40 mile, 3 furlongs, 16 perches; from thence to Harris's ferry 42 miles, 3 furlongs, 9 perches; from thence to Carlisle 17 miles; and from thence to Pittsburgh 201 miles, 2 perches; how far is it from Philadelphia to Pittsburgh?

Answer 321m. 1fu. 17p.

## CLOTH-MEASURE.

By this measure cloths, tapes, &c. are measured,

The denominations are:

2 $\frac{1}{4}$ inches ( <i>in.</i> )	make 1 nail,	-	-	<i>na.</i>
4 nails	-	1 quarter of a yard,	-	<i>qr.</i>
4 quarters	-	1 yard,	-	<i>yd.</i>
3 quarters	-	1 ell Flemish,	-	<i>E. Fl.</i>
5 quarters	-	1 ell English, or French,	<i>e. E. e. Fr.</i>	
2 $\frac{1}{2}$ quarter, or 10 nails	1 ell	Hamburgh,	<i>E. H.</i>	

## EXAMPLES.

Yds.	qr.	na.	E.Fl.	qr.	na.	E. E	qr.	na.
27	2	3	41	2	2	67	4	3
72	1	1	58	0	2	32	0	1
68	1	2	27	1	3	48	3	2
31	2	2	72	1	1	51	1	2
67	3	3	68	2	3	78	4	3
28	2	1	42	1	2	91	4	3

Application.

*Application.*

1 There are 4 pieces of linen, viz. N<sup>o</sup>. 1, 27 yards, 2 quarters, 3 nails; N<sup>o</sup>. 2, 41 yards, 3 quarters, 3 nails; N<sup>o</sup>. 3, 36 yards, 1 quarter, 2 nails; N<sup>o</sup>. 4, 33 yards, 2 quarters, 1 nail; what quantity do they contain?

*Answer* 139yds. 2qr. 1na.

2 Suppose a draper bought 10 bales of cloth, containing as follow, viz. N<sup>o</sup>. 1, 2, each 382 yards, 2 nails; N<sup>o</sup>. 3, 4, 5, each 407 yards, 3 quarters, 2 nails; and each of the rest 223 yards, 1 quarter, 1 nail; the total is required?

*Facit* 3124yds. 1qr. 3na.

## LAND-MEASURE.

This measure shews the quantity of lands.

The denominations are;

9	square feet ( <i>Fl.</i> )	make 1	yard, <i>Yd.</i>
30 $\frac{1}{4}$	yards	-	1 perch, <i>P.</i>
40	perches	-	1 rood, <i>R.</i>
4	roods	-	1 acre, <i>A.</i>

## EXAMPLES.

<i>A.</i>	<i>R.</i>	<i>P.</i>	<i>A.</i>	<i>R.</i>	<i>P.</i>	<i>A.</i>	<i>R.</i>	<i>P.</i>
47	2	28	362	2	18	264	1	38
52	1	12	637	1	22	542	3	29
63	3	31	786	2	30	379	0	13
35	0	9	213	1	10	648	2	24
49	3	39	476	3	28	236	0	36
74	2	36	367	2	39	438	0	14
<hr/>			<hr/>			<hr/>		

*Application.*

1 If one field contain 27 acres, 3 roods, 27 perches; another 17 acres, 3 roods, 36 perches; and a third 41 acres, 3 roods, 19 perches; how much in all?

*Answer* 87*A.* 3*R.* 2*P.*

2 Admit a man has one field of wheat containing 37 acres, 23 perches; another of rye 25 acres, 2 roods; two pieces of pasture each 17 acres, 1 rood, 11 perches; meadow 21 acres, 14 perches; wood-land 42 acres, 2 roods, 26 perches; what quantity does he hold?

*Answer* 161*A.* 0*R.* 5*P.*  
Liquor.

## LIQUID-MEASURE.

This measure is used for beer, cider, wine, &c.

The denominations are :

2 pints ( <i>pt.</i> )	make	1 quart,	-	-	<i>qt.</i>
4 quarts	-	1 gallon,	-	-	<i>gal.</i>
63 gallons	-	1 hoghead of wine or brandy,	-	-	<i>bbd.</i>
2 hogheads	-	1 pipe or butt,	-	-	<i>pi. or bt.</i>
2 pipes or 4 hogheads	-	1 tun,	-	-	<i>T.</i>

Note. By a law of Pennsylvania, 16 gallons make one half barrel;  $31\frac{1}{2}$  gallons 1 barrel; 64 gallons 1 double barrel; 84 gallons 1 puncheon; 42 gallons 1 tierce.

## EXAMPLES.

<i>T. bbd. gal.</i>	<i>Gal. qt. pt.</i>	<i>Gal. qt. pt.</i>
3 2 40	126 3 1	879 2 0
6 1 23	873 0 1	2348 0 1
7 3 34	468 2 1	625 3 0
2 0 29	531 1 1	2338 1 1
5 3 48	678 3 1	467 2 0
4 2 62	789 1 1	3536 0 1
<hr/>	<hr/>	<hr/>

## Application.

1 Suppose a vintner bought 4 vessels of brandy, guaging as follow, viz. 120 gallons, 2 quarts, 1 pint; 258 gallons; 136 gallons; 118 gallons, 1 quart; how much do they contain?

*Answer* 632 *gal.* 3 *qt.* 1 *pt.*

2 Sold 6 hogheads of cider, 4 of which contained each 97 gallons, 1 quart; and each of the rest 5 gallons, 2 quarts, 1 pint more; how much do they all make?

*Answer* 594 *gal.* 3 *qt.*

## DRY-MEASURE.

This measure is used for grain, fruit, salt, &c.

The denominations are :

2 pints ( <i>pt.</i> )	make	1 quart,	<i>qt.</i>
8 quarts	-	1 peck,	<i>P.</i>
4 pecks	-	1 bushel,	<i>bu.</i>

EXAMPLES.

## EXAMPLES.

Bu.	P.	qt.	Bu.	P.	qt.	Bu.	P.	qt.
63	2	5	376	1	6	3764	3	4
36	1	3	623	2	2	587	0	6
71	3	4	769	3	3	753	1	1
28	0	4	230	0	5	2465	3	0
67	3	6	786	3	7	3978	2	2
79	3	7	864	1	4	48	3	5
<hr/>			<hr/>			<hr/>		
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## Application.

1 Add 14 bushels, 2 pecks, 5 quarts; 23 bushels, 3 pecks; 8 bushels, 7 quarts; 19 bushels, 1 peck, to a granary that contains 59 bushels, 4 quarts; and tell the amount.

*Answer* 125 bushels.

2 Admit a man has 6 granaries, 4 of which contain 87 bushels, 2 pecks each, and the other two one hundred bushels and seven quarts each; how much do they all contain?

*Answer* 550 Bu. 1 pe. 6 qt.

## T I M E.

The denominations are :

60 seconds ( <i>sec.</i> )	make	-	-	1 minute	-	<i>Min.</i>
60 minutes	-	-	-	1 hour	-	<i>H.</i>
24 hours	-	-	-	1 day	-	<i>D.</i>
7 days	-	-	-	1 week	-	<i>W.</i>
4 weeks	-	-	-	1 month	-	<i>M.</i>
13 months, 1 day and six hours, or }				1 year	-	<i>Y.</i>
365 days and 6 hours						

Note. A common year consists of 365 days, and every fourth, called leap year, of 366.

The year is also divided into 12 calendar months, as follow :

The fourth, eleventh, ninth and sixth,  
Have thirty days to each affix'd ;  
And ev'ry other thirty-one,  
Except the second month alone,  
Which has but twenty-eight in fine,  
Till leap-year gives it twenty-nine.

## E X A M P L E S.

<i>Years.</i>	<i>Mo.</i>	<i>W.</i>	<i>Da.</i>	<i>Days.</i>	<i>Hr.</i>	<i>Min.</i>	<i>Sec.</i>
462	10	1	3	317	21	41	56
537	2	2	4	682	2	18	4
713	4	3	5	768	12	14	36
286	8	0	2	231	11	45	24
678	10	3	6	476	23	48	56
714	11	1	6	689	21	59	58

*Application.*

1 What day of the year was the 29th of the eighth month 1800? *Answer* 241st.

2 From the 2d of the third month, to the 19th of the eleventh month inclusive, how many days?

*Answer* 263 days.

3 Admit A to be 27 years 5 months, 2 weeks old; B 25 years; C 20 years, 7 months, 3 weeks, 4 days; D 17 years 4 days; E and F 14 years, 11 months, 1 week each; G 12 years, 1 month, 6 days; what is the sum of their ages?

*Answer* 131y. 11m. 1w.

## MOTION, OR CIRCLE-MEASURE.

This is used by astronomers, navigators, &c.

The denominations are:

60 seconds (") make - - - 1 minute '  
 60 minutes - - - - - 1 degree °  
 30 degrees - - - - - 1 sign fig.  
 12 signs, or 360 degrees, one revolution, or circle.

## E X A M P L E S.

<i>°</i>	<i>'</i>	<i>"</i>	<i>fig.</i>	<i>°</i>	<i>'</i>	<i>"</i>
6	27	48	1	14	47	51
3	32	12	1	15	12	9
8	20	30	1	12	18	28
1	39	31	1	17	41	32
9	59	48	1	29	58	59
7	46	41	1	27	39	43

## COMPOUND SUBTRACTION.

**C**OMPOUND Subtraction teaches to take one quantity of several denominations from a greater of like quality.

## • GENERAL RULE.

Place the quantities as in compound addition, with the less under the greater; then begin at the right hand, and take the under from the upper; but when the lower number is greater than the upper, take it from as many of that denomination as will make one of the next greater, and to the remainder add the upper number; set down the result and carry one to the next, &c.

**PROOF.** As in integers.

## M O N E Y.

## E X A M P L E S.

	£.	s.	d.		£.	s.	d.
From	473	14	8½		6714	18	1½
Take	164	16	4½		1896	9	8½
	<hr/>				<hr/>		
Rem.	308	18	4½				
	<hr/>				<hr/>		
Proof	473	14	8½				
	<hr/>				<hr/>		
	£.	s.	d.		£.	s.	d.
Borrowed	670	10	0½		4789	0	10
Paid	187	18	2		4089	17	4½
	<hr/>				<hr/>		
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*Application.*

1 Suppose A is indebted to the brewer one hundred thirty-eight pounds, fourteen shillings and six-pence, B 87*l.* 16*s.* 4*d.* ½; how much does one owe more than the other?

*Answer* 50*l.* 18*s.* 1*d.* ¼.

2 The brewer and baker drew bills each upon the other; the brewer stands indebted seven hundred, fifty-six pounds, seventeen shillings; the baker 437*l.* 17*s.* 8*d.* ¾; what is the balance, and in whose favour?

*Answer* 318*l.* 19*s.* 3*d.* ⅓ in the baker's.

3 Suppose

3 Suppose A owes 2000*l.* whereof he pays at one time 499*l.* 19*s.* 11*d.*  $\frac{1}{4}$  and at a second payment 1388*l.* 18*s.* 11*d.* what is the residue? *Answer* 111*l.* 1*s.* 1*d.*  $\frac{1}{4}$ .

4 Admit A have owing to him on bond 792*l.* 11*s.* 2*d.*  $\frac{1}{2}$ . and interest due thereon 193*l.* 12*s.* 9*d.*  $\frac{3}{4}$  and receives in part pay, viz. 198*l.* 17*s.* 4*d.*  $\frac{1}{2}$ , 279*l.* 11*s.* 7*d.*  $\frac{1}{4}$ , 198*l.* 19*s.* 10*d.*  $\frac{1}{2}$ , and 98*l.* 12*s.* 9*d.*  $\frac{3}{4}$ ; what sum remains unpaid?

*Answer* 210*l.* 2*s.* 4*d.*

5 Paid A B for C D's bill of 75*l.* viz. gave him R. Drawer's note for 7*l.* 12*s.* 6*d.* P. Johnson's ditto for 5*l.* an assignment on R. Dealer for 17*l.* 13*s.* 9*d.*  $\frac{1}{2}$ , in bank notes 40*l.* how much cash will make up the deficiency?

*Answer* 4*l.* 13*s.* 8*d.*  $\frac{1}{4}$ .

6 A and B have each a sum of money; A's sum, which is the greatest, is 74*l.* 17*s.* and the difference is 49*l.* 13*s.* 6*d.* what money had B?

*Answer* 25*l.* 3*s.* 6*d.*

7 A person left 25111*l.* 10*s.* 6*d.* between his son and daughter; the daughter was to have eleven thousand, eleven hundred and eleven pounds 11*s.* 11*d.* what was the son's legacy?

*Answer* 12999*l.* 18*s.* 7*d.*

8 A trader failing was indebted to A 71*l.* 12*s.* 6*d.* to B 34*l.* 9*s.* 9*d.* to C 16*l.* 18*s.* 8*d.* to D 44*l.* to E 66*l.* 7*s.* 6*d.* to F 11*l.* 2*s.* 3*d.* to G 19*l.* 19*s.* to H 20*l.* At the time, he had by him in cash 3*l.* 13*s.* 6*d.* in commodities 23*l.* 10*s.* in household furniture 21*l.* 6*s.* 11*d.* in a tenement 56*l.* 15*s.* in recoverable book debts 87*l.* 13*s.* 10*d.* Now supposing these effects all surrendered to his creditors; what will they lose by him?

*Answer* 91*l.* 10*s.* 5*d.*

## FEDERAL-MONEY.

### EXAMPLES.

	<i>E. D. d. c. m.</i>	<i>Dol. Cts.</i>	<i>E. D. d. c. m.</i>
From	1 4, 1 2 9	749 42	347 5, 0 7 2
Take	7, 9 0 2	405, 9	294 2, 8 6 5
	<hr/>	<hr/>	<hr/>
Rem.	6, 2 2 7	<hr/>	<hr/>
	<hr/>	<hr/>	<hr/>
Proof	1 4, 1 2 9	<hr/>	<hr/>
	<hr/>	<hr/>	<hr/>

*Application.*

## Application.

1 Sent 4700 dollars to the bank; and having drawn checks for 98 dollars, 15 cents; 109 dollars, 37 cents, and 7 dollars, 12 mills; what farther sum may I draw for?

*Answer* 448*E.* 5*D.* 4*d.* 6*c.* 8*m.*

2 From 7½ Eagles, deduct 7½ Dollars, and 7½ cents.

*Facit* 6*E.* 7*D.* 4*d.* 2*c.* 5*m.*

## T R O Y - W E I G H T.

## E X A M P L E S.

	<i>lb</i>	<i>oz.</i>	<i>dwt</i>	<i>gr.</i>		<i>lb.</i>	<i>oz.</i>	<i>dwt</i>	<i>gr.</i>
From	27	0	11	10		48	10	6	17
Take	9	8	1	18		19	9	19	21
	<hr/>					<hr/>			
Rem.	17	4	9	16					
	<hr/>					<hr/>			
Proof.	27	0	11	10					
	<hr/>					<hr/>			

## Application.

1 From 637*lb.* 9*oz.* 8*gr.* taking 288*lb.* 100*oz.* 9*dwt.* 20*gr.* what remains? *Answer* 348*lb.* 100*oz.* 10*dwt.* 12*gr.*

2 Bought 3 ingots of silver, weighing 204*lb.* 6*oz.* 10*dwt.* fold two of them, weighing 108*lb.* 6*oz.* 11*dwt.* 13*gr.* the weight of the other is required?

*Facit* 95*lb.* 110*oz.* 18 *dwt.* 11*gr.*

## A V O I R D U P O I S - W E I G H T.

## E X A M P L E S.

<i>T.</i>	<i>C.</i>	<i>qr.</i>	<i>lb.</i>	<i>T.</i>	<i>C.</i>	<i>qr.</i>	<i>lb.</i>	<i>C.</i>	<i>qr.</i>	<i>lb.</i>	<i>oz.</i>	<i>dr.</i>
43	16	2	21	52	12	3	15	17	1	12	14	15
19	18	1	27	24	14	2	26	6	3	21	15	9
<hr/>				<hr/>				<hr/>				

## Application.

1 Bought 45*C.* 1*qr.* 7*lb.* of Sugar; and sold 39*C.* 20*lb.* what remains? *Answer* 6*C.* 15*lb.*

C 2

2 From



## Compound Subtraction.

2 From 17*T.* 7*C.* 2*qr.* taking 12*C.* 3*qr.* 9*lb.* what remains? *Answer* 16*T.* 14*C.* 2*qr.* 19*lb.*

3 Bought 6 casks of flour, each weighing 1*C.* 3*qr.* 12*lb.* tare per barrel 17*lb.* how much neat weight?

*Answer* 10*C.* 26*lb.*

4 Sold 4 hogshheads of Sugar, two of which weighed 37*C.* 3*qr.* gross, tare 3*qr.* 17*lb.* the other two each 13*C.* 2*qr.* 4*lb.* tare 1*qr.* 10*lb.* each; the neat weight is required?

*Facit* 63*C.* 27*lb.*

## APOTHECARIES-WEIGHT.

## EXAMPLES.

lb	3	3	3	gr.
9	1	2	2	12
6	10	1	1	19
<hr/>				

lb	3	3	3	gr.
28	10	4	1	10
17	6	7	2	8
<hr/>				

## Application.

1 From 3*lb.* 3*3* 13 1*9* 12*gr.* taking 1*lb.* 7*3* 03 2*9* 18*gr.* what is left? *Answer* 1*lb.* 8*3* 03 1*9* 14*gr.*

2 If out of 17*lb.* 11*3* 63 2*9* of medicine, be taken 3 parcels, each 3*lb.* 5*3* 43 1*9* 17*gr.* what quantity is left?

*Answer* 7*lb.* 7*3* 03 2*9* 9*gr.*

## LONG-MEASURE.

## EXAMPLES.

<i>M.</i>	<i>fur.</i>	<i>P.</i>	<i>Yds.</i>	<i>ft.</i>	<i>in.</i>	<i>b.c.</i>	<i>Yds.</i>	<i>ft.</i>	<i>in.</i>	<i>b.c.</i>
41	6	21	367	2	1	2	322	1	7	1
36	7	36	191	2	8	1	245	2	3	2
<hr/>			<hr/>				<hr/>			

## Application.

1 From 50*L.* 2*M.* 1*fur.* take 19*L.* 18*P.* 4*ys.*

*Facit* 31*L.* 2*M.* 21*P.* 1*yd.* 2.

Two persons, B and C, being 327 miles distant, and  
to meet, journey as follow: B travels the first

day

# Compound Subtraction.

31

day 21 *M.* 5*fur.* the second 40 *M.* 26 *P.* the third but 5 *M.* 4*fur.* C goes the first day 60 *M.* the second 57 *M.* 35 *P.* the third 52 *M.* 6*fur.* how many miles have each travelled, and how far are they afunder?

		<i>M.</i>	<i>fur.</i>	<i>P.</i>
Answer {	B	67	1	26
	C	169	6	35
	Afunder	89	7	19

## CLOTH-MEASURE.

### EXAMPLES.

<i>Yds. qr. na.</i>	<i>E.F. qr. na.</i>	<i>E.E. qr. na.</i>
47 2 1	42 1 1	85 4 2
19 3 2	19 2 3	18 4 3
<hr/>	<hr/>	<hr/>

### Application.

- From 156 *E.E.* take 50 *E.* 1*qr.* 1*na.*  
*Facit* 105 *E.* 3*qr.* 3*na.*
- From 856 *yds.* take 200 *yds.* 2*qr.* 1*na.* 1*in.*  
*Facit* 655 *yds.* 1*qr.* 2*na.* 1*in.*  $\frac{1}{2}$ .
- From 4 pieces of cloth, each 27 *yds.* 2*qr.* 3*na.* having cut 87 *yds.* 3*qr.* 3*na.* how many yards are left?  
*Answer* 22 *yds.* 3*qr.* 1*na.*
- Bought 3 pieces of cloth, each containing 42 *yds.* of which were sold one piece, and 27 *yds.* 1*qr.* 2*na.* of another; what quantity remains?  
*Answer* 56 *yds.* 2*qr.* 2*na.*

## LAND-MEASURE.

### EXAMPLES.

<i>A. R. P.</i>	<i>A. R. P.</i>	<i>A. R. P.</i>
87 2 17	90 3 27	500 0 0
19 3 29	27 2 24	174 2 21
<hr/>	<hr/>	<hr/>

### Application.

## Application.

1 From 780*A*. 2*R*. take 396*A*. 3*R*. 15*P*.

*Facit* 383*A*. 2*R*. 25*P*.

2 If a tract of land, containing 4780*A*. 3*R*. 30*P* be divided among three persons A, B and C, viz. A to have 1784*A*. 3*R*. 24*P*. B 1658*A*. 2*R*. 36*P*, query C's share?

*Facit* 1337*A*. 1*R*. 10*P*.

3 A man purchased these several tracts of land, viz. 47*A*. 174*A*. 37*P*. 200*A*. 3*R*. 470*A*. 3*R*. and sold thereof 300*A*. 27*P*. and at a second sale 275*A*. what quantity has he left?

*Answer* 317*A*. 2*R*. 10*P*.

## LIQUID-MEASURE.

## EXAMPLES.

<i>T. bbd gal.</i>	<i>T. bbd gal.</i>	<i>Hhd. gal. qt. pt.</i>
27 1 41	29 3 40	17 28 1 0
19 3 19	16 2 27	9 36 2 1
<hr/>	<hr/>	<hr/>

## Application.

1 From 2 tons of wine, take 3*bhds* 15*gal*. 3*qt*.

*Facit* 1*T*. 47*gal*. 1*qt*.

2 Bought several vessels of cider, containing 10007*gal*. of which 4005*gal*. 2*qt*. 1*pt*. were sold; what quantity is remaining?

*Answer* 6001*gal*. 1*qt*. 1*pt*.

Bought of A 174*gal*. 3*qt*. of wine; of B twice as much as from A; of C as much as from A and B both; were sold to D 197*gal*. 1*pt* to E three times as much as to D. Query the remainder?

*Facit* 263*gal*. 2*qt*.

## DRY-MEASURE.

## EXAMPLES.

<i>L. P. qt.</i>	<i>Bu. P. qt.</i>	<i>Bu. P. qt.</i>
18 1 6	341 3 6	471 3 4
9 3 1	298 1 2	198 2 7
<hr/>	<hr/>	<hr/>

## Application.

*Application.*

- 1 From 27 bu. 1 P. take 18 bu. 2 P. 1 pt. *Facit* 8 bu. 2 P. 7 qt. 1 pt.  
2 What is the difference between 1000 bu. 7 qt. and 734 bu. 1 P. 5 qt. *Answer* 265 bu. 3 P. 2 qt.  
3 Out of a granary containing 500 bu. taking 375 bu. 2 P. 6 qt. what quantity must remain? *Answer* 124 bu. 1 P. 2 qt.

## TIME.

### EXAMPLES.

<i>Y.</i>	<i>M.</i>	<i>W.</i>	<i>D.</i>	<i>D.</i>	<i>H.</i>	<i>Min.</i>	<i>sec.</i>
1797	5	1	3	364	23	59	58
987	12	3	6	198	23	59	59

*Application.*

- 1 From 200 years, take 98y. 3m. 8h. 10sec.  
*Facit* 101y 9m. 3w. 6d. 15h. 59min. 50sec.
- 2 An indented servant had six years to serve; and when he had continued 5y. 8m. 3w. 4d. query the remainder of his time?  
*Facit* 4m. 3d.
- 3 Jacob by contract was to serve Laban for his two daughters 14 years; and when he had accomplished 11y. 11m. 11w. 11d. the remaining time is required?  
*Facit* 1y. 11lun m 3w. 3d.

Note 1. The interval of time, according to the caller, between two given dates, may be usefully and easily obtained, thus: Subtract the prior date from the latter; borrowing as many days as make the month in the subtrahend, and mentally adding 2 to that of the minuend, when necessary; carrying one, in either case, to the next name, as usual.

2. When one of the dates is in the old stil , and the other in the new, eleven days must be taken from the difference.

- 4 How much older is Jesse than Anna, his birth being on the 20th of the 12th. month, 1778, and her's the 10th of the 8th. month, 1783?

<i>Y.</i>	<i>m.</i>	<i>d.</i>
1783	8	10
177	12	20

Answer 4 7 21



5 A was born the 21st. day of the 2d. month, 1765; B the 9th. of the 4th. month, 1771; what is the difference of their ages? *Answer* 6y. 1m. 16d.

6 A bond was given the 22d. of the second month, 1787, and taken up the 12th. of the tenth month. 1789; for what time must interest be computed thereon?

*Answer* 2y. 7m. 18d.

7 A was born the 26th. day of the second month, 1775; B, on the 21st. of the ninth month, 1777; C, on the 25th. of the twelfth month, 1778; what is the difference of the ages of A and B; of B and C; also of A and C; and when will they respectively be 21 years of age?

*T. m. d.*

Difference } A & B 26 23 A on the 26th. of the 2d. month, 1796.  
 B & C 13 4 B on the 21st. of the 9th. month, 1798.  
 A & C 39 27 C on the 25th. of the 12th. month, 1799.

8 A was born on the 13th. day of the sixth month, 1746, old stile; B on the 16th. of the sixth month, 1764, new stile; what difference is there in their ages, and how old is each man on the 1st. day of the year 1790?

*Answer* { Difference 17y. 11m. 22d.  
 A's age 43y. 6m. 7d.  
 B's age 25y. 6m. 15d.

## MOTION.

### EXAMPLES.

	°	'	"	fig.	°	'	"	fig.	°	'	"
10	41	52		10	18	49	12	11	16	50	14
6	48	19		6	20	21	46	9	17	32	48
<hr/>				<hr/>				<hr/>			

### Application.

1 From 7fig. 21° 17' 51" take 3fig. 12° 51' 57".

*Facit* 4fig. 8° 25' 54".

When a planet has moved through 9 fig. 9° 9' 9" of how much is it short of a complete revolution?

*Answer* 2fig. 20° 55' 51"

COMPOUND

## COMPOUND MULTIPLICATION.

**C**OMPOUND Multiplication teaches to multiply numbers or quantities consisting of divers denominations; also, to find the amount of any quantity at the given price of an integer.

## GENERAL RULE.

Place the multiplier under the lowest denomination of the given quantity; then multiply it as in integers, and divide the product by as many of this denomination as will make one of the next greater; set down the remainder (if any) underneath, and add the quotient to the product of the next denomination, and so proceed.

Note. In multiplying money, the learner may be taught to perform it without using division, by having the pence table perfectly committed to memory, and multiplying the shillings as integers, carrying half the number of tens to the product of pounds, and prefixing the odd ten (if any) to the units place under shillings.

## PROOF.

Multiply double the compound quantity or price by half the multiplying integers; or half the former, by double the latter; or invert the multipliers when more than one.

## EXAMPLES.

£.	s.	d.	£.	s.	d.	£.	s.	d.	£.	s.	d.
24	16	4	12	8	2	987	18	11½	493	19	5¾
		2			4			6			12

49 12 8

E. D. d. c. m.	Dol. Cents.	D. d. c. m.	D. d. c. m.
84 7, 7 4 2	439, 17	9, 0 4 5	7, 3 6 8
	6	7	29
			30

508 6, 4 5 2

Note. Federal money may be multiplied as whole numbers, by any number whatsoever, observing to separate by a point as many places to the right hand of dollars in the product, as are in the sum to multiplied.



<i>lb. oz. dwt. gr.</i>	<i>T. C. qr. lb. oz. dr.</i>	<i>lb. ʒ 3 ʒ gr.</i>
9 10 17 21	6 17 3 21 14 15	3 11 7 2 13
2	3	4

<i>Deg. M. fur. P.</i>	<i>Yds. ft. in. b.c.</i>	<i>Yds. qr. na.</i>
6 54 7 36	187 2 7 2	48 3 2
5	6	7

<i>E.F. qr. na.</i>	<i>E.E. qr. na.</i>	<i>A. R. P.</i>
34 1 3	68 4 1	78 3 36
8	9	10

<i>T. bbl. gal. qt. pt.</i>	<i>Bu. P. qt.</i>	<i>T. m. w. d.</i>
4 3 57 3 1	38 3 7	476 10 2 6
11	12	12

<i>D. h. m. sec.</i>	<i>fig. ° ' "</i>	<i>fig. ° ' "</i>
36 21 48 56	1 24 48 55	10 27 50 42
6	4	3

## C A S E I.

When the given quantity does not exceed 12 ;

## R U L E.

Multiply the price of an integer by said quantity, and the product will be the answer.

E x A M-



# Compound Multiplication.

39

		£.	s.	d.		£.	s.	d.		
5	76 at	0	15	11½	}	Facit	60	12	10	
	152 at	0	7	11½						
6	78 at	8	7	0						
	156 at	3	6				651	6	0	

## C A S E 4.

When the given quantity is greater than the product of any two factors in the table;

## R U L E.

Multiply continually by as many tens less one, as there are figures in the given quantity; then multiply the last product by the figure in the left of the said quantity (if more than one;) again, multiply the figure in the units place into the given price, and that in the tens place into the price of ten, &c. place the several products as in addition, and their sum will be the answer.

## E X A M P L E S.

1	176lb. at	d.	6½ × 6	Multiply	d.	3½
		10	by 352			4 × 8 × 11 = 352

$$\begin{array}{r} 5 \ 5 \times 7. \\ \hline 10 \end{array}$$

$$\begin{array}{r} 1 \ 1 \\ \hline 8 \end{array}$$

$$\begin{array}{r} 2 \ 14 \ 2 \\ 1 \ 17 \ 11 \\ \hline 3 \ 3 \end{array}$$

$$\begin{array}{r} 8 \ 8 \\ \hline 11 \end{array}$$

$$\text{Facit } 4 \ 15 \ 4$$

$$\text{Facit } 4 \ 15 \ 4$$

		£.	s.	d.		£.	s.	d.	
2	195 at	0	1	2	}	Facit	11	7	6
	390 at	0	0	7					
3	407 at	0	3	3			66	2	9
	814 at	0	1	7½	}		623	8	9
4	875 at	0	14	3					
	1750 at	0	7	1½					
5	3540 at	2	5	0	}		7965	0	0
	7080 at	1	2	6					
6	286573 at	4	3	9					
							1200024	8	0

$$1200024 \ 8 \ 9$$

## Application.

		£.
1	9 Cwt. at 1 <i>l</i> . 11 <i>s</i> . 5 <i>d</i> . per C.	Facit 14
2	12 gallons, at 9 <i>s</i> . 6 <i>d</i> . per gallon.	5
3	42 yards, at 34 <i>s</i> . 6 <i>d</i> . per yard.	72
4	99 yards, at 18 <i>s</i> . 11 <i>d</i> . $\frac{1}{2}$ .	93 1
5	144 reams, at 13 <i>s</i> . 4 <i>d</i> . per ream.	96
6	59 yards, at 7 <i>s</i> . 10 <i>d</i> . per yard.	23
7	117 Cwt. at 1 <i>l</i> . 2 <i>s</i> . 3 <i>d</i> . per C.	130
8	198 bushels, at 6 <i>s</i> . 8 <i>d</i> . per bushel.	66
9	275 cords, at 22 <i>s</i> . 6 <i>d</i> . per cord.	309
10	336 yards, at 2 <i>s</i> . 5 <i>d</i> . per yard.	40 1
11	350 ounces, at 11 <i>d</i> . $\frac{3}{4}$ per ounce.	17
12	739 tons, at 3 <i>l</i> . 8 <i>s</i> . 11 <i>d</i> . $\frac{1}{4}$ per ton.	2547

13 Bought a piece of cloth, containing 24*y*. at 1 per yard; what comes it to? *Answer* 1

14 What cost a chest of tea, weighing 98*lb*. at per *lb*? *Answer* 20

15 What is the value of 6 *2lb*. of Sugar, at 7*d*.  $\frac{1}{2}$ . *Answer*

16 If 240 acres of land be let at 14*s*. 6*d*. per acre is the yearly rent? *Answer*

17 If a person expend 32*s*. 6*d*. per day, and at the end lay up 294*l*. 12*s*. 6*d*. what is his yearly income? *Answer* 88

18 Sold 1344*lb*. of tobacco at 18*d*. per *lb*. what value? *Answer* 100

19 If a man's income be 7*s*. 6*d*. per day, how much that in a year? *Answer* 136*l*.

20 What does a labourer earn in a year, at 2*s*. day, working 6 days in each week? *Answer* 39*l*.

21 If a merchant have owing to him 1000*l*. and he agrees to pay him 12*s*. 6*d*. in the pound; what sum the merchant receive? *Answer*

22 Suppose a person's annual income be 500*l*. and he expend daily 19*s*. 11*d*. what does he lay up at the year? *Answer* 136*l*

23 A grocer bought 6 casks of sugar, each containing 504*lb*. at 8*d*.  $\frac{1}{2}$ . per *lb*. which he disposed of at 9*d*. what was the gain of that purchase and sale? *Answer*

\* 24. A merchant bought 20 pieces of linen, each containing 25 yards, at 2s. 7d.  $\frac{1}{2}$  per yard; which he sold at 2s. 10d.  $\frac{1}{2}$  per yard; required the prime cost, what it sold for, and what was gained?

		£.	s.	d.
Answer {	Prime cost	65	12	6
	Sold for	71	17	6
	Gained	6	5	0

## COMPOUND DIVISION.

**T**HIS Rule is the reverse of compound multiplication, and teaches to divide several numbers of divers denominations; also to find the price of an integer when the quantity and its value are given.

## GENERAL RULE.

Divide the first denomination on the left; multiply the remainder, if any, by the numbers of the second denomination in a unit of the first; and add the second to the product; divide the sum as before, &c.

Note. In division of money, call each pound remaining two tens, and if there be ten in the shillings, add one, and continue the process.

## P R O O F.

By compound multiplication.

## EXAMPLES.

	£.	s.	d.		£.	s.	d.
2)	743	17	4	4)	147	14	8
Quotient	371	18	8				
		2					
Proof	743	17	4				
	£.	s.	d.		£.	s.	d.
3)	9866	19	11 $\frac{1}{4}$	4)	7685	13	8 $\frac{3}{4}$
				5)	9759	16	7 $\frac{1}{2}$

	£.	s.	d.		£.	s.	d.
6 Divide	9	17	9 $\frac{1}{2}$	by 11	Facit	0	17 11 $\frac{1}{2}$
7	11	11	3	by 6		1	18 6 $\frac{1}{2}$
8	23	2	6	by 12			

## CASE 2.

When the dividing number is the exact product of some two factors in the multiplication table;

## RULE.

Divide by one of said factors, and the quotient by the other.

Note. With respect to remainders, see note 2 in short division.

## EXAMPLES.

1 Divide	173 $\frac{1}{2}$	14s.	7d.	by 16	£.	s.	d.
	£.	s.	d.		10	17	1 $\frac{1}{2}$ 3 rem.
	4)	173	14 7			4	
		43	8 7 $\frac{1}{2}$		43	8 7 $\frac{1}{2}$	
						4	
	Facit	10	17 1 $\frac{1}{2}$	+ 3 rem.			
					173	14 7	Proof

	£.	s.	d.		£.	s.	d.
2 Divide	3	10	10 $\frac{1}{2}$	by 27	Facit	0	2 7 $\frac{1}{2}$
3	52	10	0	by 56		0	18 9
4	372	16	0	by 96		3	17 8
5	225	0	0	by 120		1	17 6
6	474	0	0	by 72		6	11 8
7	948	0	0	by 144			

## CASE 3.

When the dividing number is not the exact product of any two factors in the table;

## RULE.

Divide the greatest denomination by said number, as in long division; multiply the remainder, if any, by as many of the next denomination as make one of that, adding in the number of the next name: divide the product as before, &c.

E X A M.



## Compound Division.

## EXAMPLES.

1 Divide  $\begin{array}{r} \text{£. s. d.} \\ 36 \text{ } 16 \text{ } 3 \text{ by } 19 \\ \text{l. s. d.} \end{array}$

$$\begin{array}{r} 19 \overline{) 36 \text{ } 16 \text{ } 3} \quad 1 \text{ } 18 \text{ } 9 \text{ Facit} \\ \underline{19} \qquad \qquad \quad 3 \times 6 + 1 = 19 \\ \text{ } \quad \quad \quad 17 \qquad \quad 5 \text{ } 16 \text{ } 3 \\ \quad \quad \quad \underline{20} \qquad \quad \quad \underline{6} \\ \text{ } \quad \quad \quad 19 \overline{) 356} \quad 34 \text{ } 17 \text{ } 6 \\ \quad \quad \quad \underline{19} \qquad \quad \quad \underline{1 \text{ } 18 \text{ } 9} \\ \quad \quad \quad 166 \qquad \quad 36 \text{ } 16 \text{ } 3 \text{ Proof.} \\ \quad \quad \quad \underline{152} \\ \quad \quad \quad 14 \\ \quad \quad \quad \underline{12} \\ \quad \quad 19 \overline{) 171} \\ \quad \quad \quad \underline{171} \end{array}$$

2 Divide  $\begin{array}{r} \text{£. s. d.} \\ 6 \text{ } 6 \text{ } 8 \text{ by } 38 \\ \text{Facit} \end{array}$

$$\begin{array}{r} \text{£. s. d.} \\ 6 \text{ } 6 \text{ } 8 \text{ by } 38 \\ 46 \text{ } 17 \text{ } 4 \text{ by } 74 \\ 189 \text{ } 14 \text{ } 0 \text{ by } 95 \\ 310 \text{ } 12 \text{ } 0\frac{1}{2} \text{ by } 106 \\ 3236 \text{ } 12 \text{ } 4\frac{1}{2} \text{ by } 654 \end{array}$$

$$\begin{array}{r} \text{Facit} \\ 0 \text{ } 3 \text{ } 4 \\ 0 \text{ } 12 \text{ } 8 \\ 1 \text{ } 19 \text{ } 11\frac{1}{2} \\ 2 \text{ } 18 \text{ } 7\frac{1}{2} \\ 4 \text{ } 18 \text{ } 11\frac{1}{2} \end{array}$$

## Application.

1 Bought 4 bushels of salt for 17s. 6d. what was it per bushel? *Answer 4s. 4d.  $\frac{1}{2}$ .*

2 Sold 8 yards of linen for 3l. 11s. 8d. what was the price per yard? *Answer. 8s. 11d.  $\frac{1}{2}$ .*

3 A labourer had 3l. 3s. for 12 days service; what was that by the day? *Answer 5s. 3d.*

4 If 24 yards of cloth cost 18l 6s. the price of 1 yard is required? *Answer 15s. 3d.*

5 What is wheat per bushel, when 42 bushels are sold for 17l. 13s. 6d. *Answer 8s 5d.*

6 When 100 gallons of wine are sold for 83l. 6s. 8d. what is a gallon worth? *Answer 16s 8d.*

7 If 58*lb.* of sugar be sold for 2*l.* 5*s.* 11*d.* what is that per *lb.*? *Answer* 9*d.*  $\frac{1}{2}$

8 Bought 230 bushels of salt for 26*l.* 16*s.* 8*d.* what was it per bushel? *Answer* 2*s.* 4*d.*

9 If 814*lb.* of double refined sugar cost 66*l.* 2*s.* 9*d.* what was it by the *lb.*? *Answer* 1*s.* 7*d.*  $\frac{1}{2}$

10 If the expence of a public building, amounting to 7965*l.* be discharged equally by 3540 persons; what is each man's quota? *Answer* 2*l.* 5*s.*

11 Bought 5 pieces of cloth, each containing 20 yards, for 94*l.* 3*s.* 4*d.* what was it per yard? *Answer* 18*s.* 10*d.*

12 Sold 144 bushels of wheat for 57*l.* what was the price of one bushel, at that rate? *Answer* 7*s.* 11*d.*

13 If 400*lb.* of sugar cost 14*l.* 3*s.* 4*d.* what was it by the *lb.*? *Answer* 8*d.*  $\frac{1}{2}$

14 Suppose a man left to 3 persons, viz. to A  $\frac{1}{4}$  of 173*l.* 13*s.* 9*d.* to B  $\frac{1}{2}$  of 147*l.* 11*s.* 4*d.* and to C  $\frac{3}{4}$  of 128*l.* 9*s.* 11*d.* how much is each man's share, and the whole sum left?

	£	s.	d.	
<i>Answer</i> {	43	8	5 $\frac{1}{4}$	A;
	73	15	8	B;
	96	7	5 $\frac{1}{4}$	C;
	213	11	6 $\frac{1}{2}$	Sum left.

15 A man left 1000*l.* to his wife and three sons; to his wife  $\frac{1}{4}$ , to the eldest son  $\frac{1}{4}$ , and the remainder to be equally divided betwixt the other two; what is each one's legacy?

	£	s.	d.	
<i>Answer</i> {	333	6	8	Wife;
	250	0	0	eldest Son;
	208	6	8	others each.

16 Divide 1685*l.* 18*s.* 6*d.* thus; give A  $\frac{1}{2}$ , B  $\frac{1}{3}$ , and C the rest; what is each man's share?

	£	s.	d.	
<i>Answer</i> {	842	19	3	A's share;
	561	19	6	B's,
	280	19	9	C's.

17 A person bequeathed his estate, amounting to 8684*l.* 18*s.* 9*d.* as follows: to his wife  $\frac{2}{3}$ , to his son  $\frac{1}{3}$ , and the residue to his daughter; what was the share of each!

*Answer*

$$\begin{array}{r} \text{Answer} \left\{ \begin{array}{l} \text{£. s. d.} \\ 3473 \ 19 \ 6 \text{ Wife;} \\ 2894 \ 19 \ 7 \text{ Son;} \\ 2315 \ 19 \ 8 \text{ Daughter.} \end{array} \right. \end{array}$$

18 If an estate of 4968*l.* 18*s.* 9*d.* be divided in this manner; the widow to have  $\frac{1}{3}$ , the eldest son  $\frac{1}{4}$ , an only daughter  $\frac{1}{5}$ , and the residue equally among 3 other sons; what is the share of each?

$$\begin{array}{r} \text{Answer} \left\{ \begin{array}{l} \text{£. s. d.} \\ 1656 \ 6 \ 3 \text{ Widow;} \\ 1242 \ 4 \ 8\frac{1}{4} \text{ eldest Son;} \\ 993 \ 15 \ 9 \text{ Daughter;} \\ 358 \ 17 \ 4\frac{1}{4} \text{ others each.} \end{array} \right. \end{array}$$

19 If 987*l.* 12*s.* 6*d.* be equally divided amongst 60 poor persons, how much will each one have?

*Answer* 16*l.* 9*s.* 2*d.*  $\frac{1}{2}$

20 Suppose a man left to 5 of his friends 10986*l.* thus, A to have  $\frac{1}{3}$ , B  $\frac{1}{4}$ , C  $\frac{1}{5}$ , D  $\frac{1}{6}$ , and E the rest; what is the share of each?

$$\begin{array}{r} \text{Answer} \left\{ \begin{array}{l} \text{£. s.} \\ 3662 \ 0 \text{ A;} \\ 2746 \ 10 \text{ B;} \\ 2197 \ 4 \text{ C;} \\ 1831 \ 0 \text{ D;} \\ 549 \ 6 \text{ E.} \end{array} \right. \end{array}$$

21 A father left 1000*l.* at his decease, with 8 bills, each 54*l.* 10*s.* 6*d.* he ordered his debts to be paid, amounting to 260*l.* with 30*l.* for his funeral expences; his clear estate he bequeathed thus; to his daughter  $\frac{1}{2}$ , and the residue to 7 sons equally; what was the share of each child?

$$\begin{array}{r} \text{Answer} \left\{ \begin{array}{l} \text{£. s. d.} \\ 1127 \ 7 \ 1\frac{1}{4}+ \text{ Daughter;} \\ 1288 \ 8 \ 1\frac{1}{2}+ \text{ Son's each.} \end{array} \right. \end{array}$$

22 A druggist bought two parcels of drugs, which together weighed 9*C.* 3*qr.* 16*lb.* for 97*l.* 17*s.* 6*d.* their difference in weight was 1*C.* 2*qr.* 16*lb.* and in price 8*l.* 13*s.* 3*d.* their respective weights and values are required?

$$\begin{array}{r} \text{Answer} \left\{ \begin{array}{l} \text{C. qr. lb.} \\ 4 \ 0 \ 14 \\ 5 \ 3 \ 2 \end{array} \right. \quad \begin{array}{l} \text{Values} \left\{ \begin{array}{l} \text{£. s. d.} \\ 44 \ 12 \ 1\frac{1}{2} \\ 53 \ 5 \ 4\frac{1}{2} \end{array} \right. \end{array} \end{array}$$

REDUCTION.

## REDUCTION.

**R**EDUCTION is the reducing of a given sum or quantity, to a different denomination, retaining the same-value.

## RULE.

When  $\left\{ \begin{array}{l} \text{descending to a lower name multiply} \\ \text{ascending to a higher name divide} \end{array} \right\}$  by that number of the lower, which makes a unit of the higher.

Note 1. When the given quantity is compound, its lower names are to be severally taken in with their like denominations in the process.

2. Remainders are synonymous with their dividends.

## PROOF.

Reduce the result of the operation back to its given name.

## MONEY.

<i>Far.</i>	<i>Pen.</i>	<i>Shil.</i>	<i>Poun.</i>
4 =	1 =	$\frac{1}{12}$ =	$\frac{1}{240}$
48 =	12 =	1 =	$\frac{1}{20}$
960 =	240 =	20 =	1

Note To reduce	<i>Dollars</i>	<i>To Pounds, Pennsylvania currency,</i>	$\times 3 \div 8$	<i>and the contrary.</i>
	<i>French Pistoles</i>		$\times 11 \div 8$	
	<i>Spanish Pistoles</i>		$\times 7 \div 5$	
	<i>English Guineas</i>		$\times 7 \div 4$	
	<i>Moidores</i>		$\times 9 \div 4$	
	<i>Doubloons</i>		$\times 5 + \frac{1}{4} \text{ pro.}$	

To reduce Dollars to Crowns, deduct  $\frac{1}{11}$ , and Crowns to Dollars, add  $\frac{1}{10}$ .

## EXAMPLES.

1 Reduce 365*l.* to pence.

<i>£.</i>	<i>d.</i>
365	12)87600
20	
7300	2 0)7300
12	Proof 365

*Facit* 87600

- 2 Bring 2691l. 13s. 2. into pence. 645998d.
- 3 Reduce 87600 pence to pounds. 365l.
- 4 Reduce 322999 pence to pounds. 1345l. 16s. 7d.
- 5 In 916l. 10s. 9d.  $\frac{1}{2}$ , how many *grs*? Answer 879879*grs*
- 6 In 77l. 14s. 7d.  $\frac{1}{2}$ , how many half pence?  
Answer 37311 half pence.
- 7 In 879879*grs*. how many pounds? 916l. 10s. 9d.  $\frac{1}{2}$
- 8 In 37311 half pence, how many pounds?  
Answer 77l. 14s. 7d.  $\frac{1}{2}$ .
- 9 Reduce 160l. 15s. 6d. into six-pences.  
Facit 6431 six-pences.
- 10 Reduce 194l. 10s. 8d. to groats 11672 groats.
- 11 Reduce 272l. 12s. 6d. into two-pences.  
Facit 32715 two-pences
- 12 In 6431 six-pences, how many pounds?  
Answer 160l. 15s. 6d.
- 13 In 35016 groats, how many pounds? 583l. 12s. 0d.
- 14 In 32715 two-pences, how many pounds? 272l. 12s. 6d.
- 15 Reduce 1678 dollars to six-pences.  
Facit 25170 sixpences.
- 16 Reduce 50340 three-pences to dollars. 1678 dollars.
- 17 Reduce 988 French crowns to groats. 24453 groats.
- 18 Reduce 24453 groats into French crowns, 988 crowns.
- 19 In 3872 three-pences, how many pounds? Ans. 48l. 8s.
- 20 How many three-pences, groats and six-pences, are  
in 968 shillings?  
Answer 3872 three-pences, 2904 groats 1936 six-pences.
- 21 In 728 dollars, how many pence and farthings?  
Answer 65520d. 262080*grs*.
- 22 In 969 French crowns, how many pence and half-  
pence? Answer 95931d. 191862 half-pence.
- 23 In 262080 farthings, how many dollars and pounds?  
Answer 728 dollars, 273l.
- 24 How many French crowns and pounds are in 191862  
half-pence? Answer 969 crowns, 399l. 14s. 3d.
- 25 In 85 English guineas, how many pence in Pennsylv-  
ania currency? Answer 35700d.
- 26 In 107100 pence, how many guineas, at 35s. each?  
Answer 255.
- 27 In 81000 three-pences, how many moidores at 45s.  
each? Answer 450 moidores.
- 28 Reduce



- 28 Reduce 450 moidores to six-pences, Pennsylvania currency.  
*Facit* 40500 six-pences.
- 29 Reduce 137*l.* 15*s.* 6*d.*  $\frac{1}{4}$ , into farthings, and these again to pounds.  
*Facit* 132267*qrs.*
- 30 Bring 275*l.* 11*s.* 1*d.*  $\frac{1}{2}$  to half-pence, and these back to pounds.  
*Facit* 132267 half-pence.
- 31 How many pence, groats and six-pences, are in 24*l.* 4*s.*  
*Answer* 5808*d.* 1452 groats, 968 six-pences.
- 32 In 630 pistareens, how many pounds Pennsylvania currency?  
*Answer* 47*l.* 5*s.*
- 33 In 728 dollars, how many pounds Pennsylvania currency?  
*Answer* 273*l.*
- 34 Reduce 546*l.* Pennsylvania currency to dollars.  
*Facit* 1456 dollars.
- 35 How many pounds Pennsylvania currency are equal to 537 dollars?  
*Answer* 201*l.* 7*s.* 6*d.*
- 36 If 402*l.* 15*s.* Pennsylvania currency be exchanged for dollars, what number is equivalent?  
*Answer* 1074 dollars.
- 37 How many French crowns are equal to 697*l.* 2*s.* 6*d.* Pennsylvansia currency?  
*Answer* 1690 crowns.
- 38 In 845 French crowns, how many pounds Pennsylvania currency?  
*Answer* 348*l.* 11*s.* 3*d.*
- 39 What number of French crowns are equal to 891 dollars?  
*Answer* 810 crowns.
- 40 How many dollars are equal to 1620 French crowns?  
*Answer* 1782 dollars.
- 41 In 678 English guineas, how many pounds sterling; also, how much in Pennsylvania currency?  
*Answer* 711*l.* 18*s.* sterling; 1186*l.* 10*s.* currency.
- 42 How many crowns of 5*s.* each, half crowns, and shillings, are in 279*l.* 13*s.* and the number of each to be equal?  
*Answer* 658.
- 43 In crowns, half-crowns, and shillings, of each 658, how many pounds?  
*Answer* 279*l.* 13*s.*
- 44 In 1038*l.* 12*s.* 4*d.* how many French crowns, dollars, shillings and pence, and of each an equal number?  
*Answer* 1234.
- 45 In French crowns, dollars, shillings and pence, of each 2468, how many pounds!  
*Answer* 2077*l.* 4*s.* 8*d.*
- 46 How many pounds Pennsylvania currency, are equal to 246 French pistoles?  
*Answer* 338*l.* 5*s.*

47 Reduce 500 Spanish pistoles into pounds Pennsylvania currency *Facit 700l.*

48 In 180 English guineas, how many pounds Pennsylvania currency; *Answer 315l.*

49 What sum in Pennsylvania currency, is equal to 350 moidores? *Answer 787l. 10s.*

50 In a purse of 120 doubloons; how many pounds sterling? Also, how much in Pennsylvania currency?

*Answer 396l. sterling, 675l. currency.*

51 How many English guineas are equal in value to 1240 moidores? And what is their sum in Pennsylvania currency. *Answer 1594 guineas and 6s. ster. 2790l. cur.*

52 What do 1320 marks, at 13s. 4d. each, amount to? *Answer 880l.*

### FEDERAL MONEY.

<i>Mills.</i>	<i>Cents.</i>	<i>Dimes.</i>	<i>Dol.</i>	<i>Eagles.</i>
10 =	1 =	$\frac{1}{10}$ =	$\frac{1}{100}$ =	$\frac{1}{1000}$
100 =	10 =	1 =	$\frac{1}{10}$ =	$\frac{1}{100}$
1000 =	100 =	10 =	1 =	$\frac{1}{10}$
10000 =	1000 =	100 =	10 =	1

### EXAMPLES.

1 How many cents are equivalent to 7 eagles?

7 *Eagles.*

10

—

70 *Dollars.*

10

—

700 *Dimes.*

10

—

or thus:

7 *Eagles.*

1000

—

1|000)7|000

*Answer 700 Cents. 7000 Cents. Proof 7 Eagles.*

Note: { *Cents*, by deducting one tenth of their number, are reduced to Pence,  
*Pence*, by adding one ninth thereof, make *Cents*.

2 Reduce 50 cents, or hundredths of a dollar, to pence, or ninetyeths, and these pence back again to cents.

$$\begin{array}{rcl}
 & 50 & \text{Cents.} \\
 \frac{1}{10} = & \underline{5} & \text{Subt.} \\
 \text{Facit} & 45 & \text{Pence.} \\
 \frac{1}{9} = & \underline{5} & \text{Add.} \\
 \text{Proof} & 50 & \text{Cents.}
 \end{array}$$

3 In 8, cents, how many pence?

*Answer 76d.*



- 4 How many cents are equal to 73 pence? *Answer* 81.
- 5 In 742 dollars, how many mills? *Answer* 742000m.
- 6 Reduce 75460 mills to dollars *Facit* 75 D. 46c.
- 7 Try how many dimes are in a dozen doubloons.  
*Facit* 1791d. 96m.
- 8 Convert 100 pounds sterling, into federal eagles.  
*Facit* 44E. 4D.
- 9 Bring 50 French guineas to cents. *Facit* 23000c.

### TROY - WEIGHT.

Grai.	Pen.	Oun.	Poun.
24 =	1 =	$\frac{1}{15}$ =	$\frac{1}{144}$
480 =	20 =	1 =	$\frac{1}{12}$
5760 =	240 =	12 =	1

### EXAMPLES.

- 1 How many ounces, pennyweights and grains, are in 37lb. *Answer* 444oz. 8880dwt. 213120gr.
- 2 Reduce 213120 grains to pounds, *Facit* 37lb.
- 3 In 59lb. 13dwt 5gr. how many grains?  
*Answer* 340157gr.
- 4 In 4 ingots of silver, each weighing 4lb. 7oz. 2dwt. how many grains? *Answer* 105792gr.
- 5 In 9lb. 7oz. 10dwt. of silver, how many spoons, each 5oz. 10dwt. *Answer* 21 spoons.
- 6 How many lockets, each to weigh half an ounce, will 4560 grains of gold make? *Answer* 19 lockets.
- 7 In 1 dozen falvers, each 2lb. 10z. 15dwt. and 1 dozen tankards, each 1lb. 3oz. 15dwt. 22gr. what is their weight?  
*Answer* 41lb. 6oz. 11dwt.
- 8 How many porringers, each to weigh 11oz. will 19lb. 3oz. of silver make? *Answer* 21 porringers.

### AVOIRDUPOIS - WEIGHT.

Drams.	Ounces.	Pounds	Qua.	Hun.	Tons
16 =	1 =	$\frac{1}{16}$ =	$\frac{1}{448}$ =	$\frac{1}{1792}$ =	$\frac{1}{35840}$
256 =	16 =	1 =	$\frac{1}{16}$ =	$\frac{1}{128}$ =	$\frac{1}{1120}$
7168 =	448 =	28 =	1 =	$\frac{1}{4}$ =	$\frac{1}{80}$
28672 =	1792 =	112 =	4 =	1 =	$\frac{1}{20}$
173440 =	35840 =	2240 =	80 =	20 =	1

### EXAMPLES.

## EXAMPLES.

- 1 In 15 tons, how many hundred weight, quarters and pounds?  
*Answer* 300C.wt. 1200qr. 33600lb.
- 2 Reduce 67200lb. to tons.  
*Facit* 30 tons.
- 3 In 9C. 5lb. how many ounces?  
*Answer* 16208oz.
- 4 Reduce 20571005 drams to tons.  
*Facit* 35T. 17C. 1qr. 23lb. 7oz. 13dr.
- 5 In 6 casks of flour, each 2C. 2qrs. 11lb. how many pounds?  
*Answer* 1746lb.
- 6 In 235 parcels of sugar, each 52lb. how many hundred weight?  
*Answer* 109C 12lb.
- 7 In 17C. 1qr. 6lb. how many parcels, each 34lb.  
*Answer* 57 parcels.
- 8 If 12 casks of flour of equal weight, contain 3492lb. the weight of one cask is required? *Answer* 2C. 2qrs. 11lb.

## APOTHECARIES - WEIGHT.

Grai.	Scru.	Dra.	Oz.	Pounds.
20 =	1 =	$\frac{1}{4}$ =	$\frac{1}{16}$ =	$\frac{1}{128}$
60 =	3 =	1 =	$\frac{1}{8}$ =	$\frac{1}{96}$
480 =	24 =	8 =	1 =	$\frac{1}{12}$
5760 =	288 =	96 =	12 =	1

## EXAMPLES.

- 1 In 17lb. how many ounces, drams and scruples?  
*Answer* 2043, 16323, 48969
- 2 In 13332005 grains, how many pounds?  
*Answer* 231lb, 33, 58r.
- 3 In 5lb. of drugs, how many parcels, each 16 drams?  
*Answer* 30 parcels.
- 4 In 20 parcels of drugs, each weighing 24 drams, how many pounds?  
*Answer* 5lb.

## LONG - MEASURE.

Bar	Cor.	Inches.	Feet.	Yards.	Poles.	Furlo.	Miles.
3 =	1 =	$\frac{1}{12}$ =	$\frac{1}{36}$ =	$\frac{1}{108}$ =	$\frac{1}{270}$ =	$\frac{1}{540}$ =	$\frac{1}{1080}$
36 =	12 =	1 =	$\frac{1}{3}$ =	$\frac{1}{36}$ =	$\frac{1}{90}$ =	$\frac{1}{180}$ =	$\frac{1}{360}$
108 =	36 =	3 =	1 =	$\frac{1}{3}$ =	$\frac{1}{9}$ =	$\frac{1}{18}$ =	$\frac{1}{36}$
594 =	198 =	16 $\frac{1}{2}$ =	5 $\frac{1}{2}$ =	1 =	$\frac{1}{2}$ =	$\frac{1}{4}$ =	$\frac{1}{8}$
23760 =	7920 =	660 =	220 =	40 =	1 =	$\frac{1}{2}$ =	$\frac{1}{4}$
190080 =	63360 =	5280 =	1760 =	320 =	8 =	1 =	1

EXAMPLES.

## EXAMPLES.

- 1 How many inches are in 273 miles? *Ans.* 17297280 in.
- 2 In 34594560 inches, how many miles? *Ans.* 546m.
- 3 Reduce 2M. 1fur. 8P. 3yds. 2in. into inches.  
*Facit* 136334 inches.
- 4 Reduce 2280060 barley-corns to miles.  
*Facit* 11M. 7fur. 38P. 2yds. 2ft.
- 5 Required the number of revolutions, a wheel 18ft. 4in. will make, in running 150 miles. *Facit* 43200
- 6 What distance must a measuring wheel, 18ft. 4in in circumference, run to make 86400 turns? *Facit* 300 miles.
- 7 Required the earth's circumference in yards.  
*Facit* 44035200.

## CLOTH-MEASURE.

<i>Inc.</i>	<i>Na</i>	<i>Qr.</i>	<i>Yd.</i>
$2\frac{1}{4} = 1$	$= \frac{1}{4}$	$= \frac{1}{8}$	
$9 = 4$	$= 1$	$= \frac{1}{4}$	
$36 = 16$	$= 4$	$= 1$	

## EXAMPLES.

- 1 In 15yds. 3qr. 1na. how many nails? *Answer* 253na.
- In 1012 nails of cloth, how many yards?  
*Answer* 63yds 1qr.
- 3 Reduce 73 ells Flemish to quarters. *Facit* 219qrs.
- 4 How many ells Flemish are in 1752 nails? *Ans.* 146ells.
- 5 How many ells English are in 1408 nails?  
*Answer* 70E. 2qrs.
- 6 In 10 bales of cloth, each 10 pieces, and each piece 12 yards, how many yards? *Answer* 1200 yards.
- 7 In 408yds. 3qrs. of cloth, how many ells Flemish; also, how many ells English? *Answer* 545E. Fl. 327E. E.
- 8 In 4 bales of cloth, each 12 pieces, and each piece 24 ells English, how many yards, and ells Flemish?  
*Answer* 1440yards, 1920 ells Flemish.

## LAND-MEASURE.

<i>Sq Inch.</i>	<i>Sq. Feet</i>	<i>Sq. Yd.</i>	<i>Sq. Pe.</i>	<i>Rond.</i>	<i>Acre</i>
144 =	1 =	$\frac{1}{9} =$	$\frac{1}{1600} =$	$\frac{1}{108900} =$	$\frac{1}{435600} =$
1296 =	9 =	1 =	$\frac{1}{121} =$	$\frac{1}{12100} =$	$\frac{1}{158400} =$
39204 =	$272\frac{1}{4} =$	$30\frac{1}{4} =$	1 =	$\frac{1}{40} =$	$\frac{1}{1600} =$
1568160 =	10890 =	1210 =	40 =	1 =	$\frac{1}{6400} =$
6272640 =	43560 =	4840 =	160 =	4 =	$\frac{1}{400} =$

## E X A M P L E S.

- 1 Reduce 27 *A.* 1 *R.* 32 *P.* into perches. *Facit* 4392 *Per.*
- 2 Reduce 4392 perches into acres. *Facit* 27 *A.* 1 *R.* 32 *P.*
- 3 Suppose one field to contain 6 *A.* 2 *R.* 36 *P.* another 19 acres and a third 12 *A.* 1 *R.* which are to be divided into shares of 76 perches each; query the number?  
*Answer* 61 shares.
- 4 A tract of land containing 1299600 square perches, is to be divided in 25 plantations; query the number of acres in each?  
*Answer* 324 *A.* 3 *R.* 24 *P.*

## L I Q U I D - M E A S U R E.

<i>Pints.</i>	<i>Gal.</i>	<i>Tic.</i>	<i>Hbd.</i>	<i>Punch.</i>	<i>P.orB.</i>	<i>Ton.</i>
8 =	1 =	$\frac{1}{4}$	$\frac{1}{8}$	$\frac{1}{16}$	$\frac{1}{32}$	$\frac{1}{64}$
336 =	42 =	1 =	$\frac{1}{2}$	$\frac{1}{4}$	$\frac{1}{8}$	$\frac{1}{16}$
504 =	63 =	$1\frac{1}{2}$ =	1 =	$\frac{3}{4}$	$\frac{1}{2}$	$\frac{3}{8}$
672 =	84 =	2 =	$1\frac{1}{2}$ =	1 =	$\frac{3}{4}$	$\frac{1}{2}$
1008 =	126 =	3 =	2 =	$1\frac{1}{2}$ =	1 =	$\frac{3}{4}$
2010 =	252 =	6 =	4 =	3 =	2 =	1

## E X A M P L E S.

- 1 In 19 *bbds.* of wine, how many pints? *Answer* 9576 *pt.*
- 2 Reduce 19152 pints to *bbds.* *Facit* 38 *bbds.*
- 3 In 11 barrels of beer, how many quarts?  
*Answer* 1386 *qt.*
- 4 How many dozen of gallon, quart and pint bottles, each a like number, will be required to contain a cask of Madeira, whose content is 165 gallons? *Answer* 10 dozen.

## D R Y - M E A S U R E.

<i>Pt.</i>	<i>Qt.</i>	<i>Pcc.</i>	<i>Bu.</i>
2 =	1 =	$\frac{1}{2}$ =	$\frac{1}{4}$
8 =	4 =	$\frac{1}{2}$ =	$\frac{1}{2}$
16 =	8 =	1 =	$\frac{1}{2}$
64 =	32 =	4 =	1

## E X A M P L E S.

- 1 bushels, 5 quarts, how many pints?  
*Answer* 1098 pints.
- 2 lb

- 2 In 5054 pints, how many bushels?

*Answer* 78bu. 3pe. 7qt.

- 3 In 4 granaries, each containing 65bu. 1pe. 6qt. how many sacks will they fill, each to hold 5bu. 2pec.

*Answer* 47 sacks, 3bu. 1pec. over.

## T I M E.

<i>Seconds.</i>	<i>minutes.</i>	<i>hours.</i>	<i>days.</i>	<i>weeks.</i>	<i>months.</i>
60 =	1 =	$\frac{1}{24} =$	$\frac{1}{1440} =$	$\frac{1}{10080} =$	$\frac{1}{40320} =$
3600 =	60 =	1 =	$\frac{1}{24} =$	$\frac{1}{168} =$	$\frac{1}{672} =$
86400 =	1440 =	24 =	1 =	$\frac{1}{7} =$	$\frac{1}{28} =$
604800 =	10080 =	168 =	7 =	1 =	$\frac{1}{4} =$
2419200 =	40320 =	672 =	28 =	4 =	1 =
31557600 =	525960 =	8766 =	$365\frac{1}{4} =$	$52w. 1d. 6h. =$	$1y. =$

## E X A M P L E S.

- 1 Reduce 37w. 5d. into minutes. *Facit* 380160m.
- 2 Reduce 24796800sec. to weeks. *Facit* 41w.
- 3 How many hours, minutes and seconds are there in a year?  
*Answer* 8766h. 525960m. 31557600sec.
- 4 From the creation of the world, 4004 years before Christ, to the year 1790, inclusive, how many days have passed?  
*Answer* 2116258d. 12h.

## M O T I O N.

<i>Seconds.</i>	<i>minutes.</i>	<i>deg.</i>	<i>signs.</i>	<i>revolu.</i>
60 =	1 =	$\frac{1}{60} =$	$\frac{1}{1800} =$	$\frac{1}{87600} =$
3600 =	60 =	1 =	$\frac{1}{30} =$	$\frac{1}{365} =$
108000 =	1800 =	30 =	1 =	$\frac{1}{12} =$
1296000 =	21600 =	360 =	12 =	1 =

## E X A M P L E S.

- 1 In 6 signs of the zodiac how many minutes?  
*Answer* 108000min.
- 2 How many seconds are there in one complete revolution of any planet?  
*Answer* 12960000sec.

*Application.*

- 1 In 400 quarter dollars, how many pounds?  
*Answer* 37l. 10s.
- 2 How many marks, each 13s. 4d. are in 496l. 13s. 4d?  
*Answer* 745.
- 3 How

3 How many English guineas are equal in value to 1260 moidores? *Answer* 1620

4 How many ducatoons of 5s. 6d.  $\frac{1}{2}$ . each, are equal to 476 pieces, at 4s. 7d. each? *Answer* 393 duc. 3s. 9d.  $\frac{1}{2}$ .

5 By what mult 6l. 17s. 3d.  $\frac{1}{2}$ . be multiplied to produce a product of 123l. 11s. 3d? *Answer* 18.

6 How many plates, of 12 ounces each, may be manufactured out of 8 ingots of silver, each 36 ounces? *Answer* 24.

7 If a ship's cargo be 250 pipes, 130 hogsheds, and 150 half ditto; how many gallons in all? And allowing every pint to be a pound, what burthen was the ship of? *Answer* 44415 gallons, 158T 12C. 2qr.

8 What number of canisters, each to hold 38lb. may be filled from 28 chests of tea, each 2C. 1qr. 14lb? *Answer* 196.

9 How many parcels of 6lb. 8lb. 12lb. and 16lb can a grocer have out of two hogsheds of tobacco, each weighing neat 4C. 3qr. 24lb. and to have of each a like number? *Answer* 26 of each and 20lb.

10 How many barley-corns would reach round the terrestrial globe, which is 360 degrees, and each degree 69  $\frac{1}{2}$  miles? *Answer* 4755801600 barley corns.

11 How many boxes, each to hold 24lb may be filled out of two hogsheds of tobacco, each containing 7C 2qr? *Answer* 70.

12 Received from Jamaica 56 hogsheds of sugar, each 12C. 1qr. 10lb. (100lb. being their hundred weight) how many hundred weight here, of 12lb *Answer* 617C 2qr.

13 Imported from Rotterdam 46 bales of cloth, each containing 24 pieces, and each piece 42 ells Flemish; how many yards were therein? *Answer* 34776 yards.

14 How many steps of 2ft. 8in. 2b.c. will a man take in walking 7M 1fur. 94yds. *Answer* 13923+

15 A carriage wheel is 17ft. 2in. 1b.c. in circumference, and turns 12898 times; the distance is required? *Answer* 42+ miles.

16 How many seconds of time have passed since the creation of the World, including the year 1790? *Answer* 182844734400 seconds.

17 If 2yds. 3qrs. of cloth will make a coat, 1yd. 1qr. a waist-coat, and 1yd 1qr. 2na. a pair of breeches; what number



number of yards will it take to make complete suits for 450 men?

*Answer* 2418yds. 3qrs.

18 How many rings, each weighing 5dwt. 7gr. may be made of 3lb. 5oz. 16dwt. 2gr. of gold?

*Answer* 158.

## THE SINGLE RULE OF THREE.

**T**HE single rule of three, is that wherein three numbers, or terms, are given, two of which are of one kind to find a fourth proportional number of the same name with the other given term; and this consists of two proportions, *viz.* direct and inverse.

### RULE for STATING, &c.

Of the two similar terms, set that in the first place which implies the supposition, that of the same kind with the term sought in the second place, and that on which the demand lies, in the third. If the first and third be not of one denomination, reduce both to the lowest in either, and the second to its lowest given denomination; then consider whether the proportion be direct or inverse.

### DIRECT PROPORTION.

Direct proportion is that wherein the third term is greater than the first, and requires the fourth term to be greater than the second; or the third less than the first, and requires the fourth to be less than the second;

For, as often as the third term is greater or less than the first, so many times will the fourth be greater or less than the second, Thus,

$$\begin{array}{l} \text{As } \left\{ \begin{array}{l} 3 \dots 6 :: 9 \dots 18 \text{ more requiring more.} \\ 20 \dots 40 :: 5 \dots 10 \text{ less requiring less.} \end{array} \right. \end{array}$$

### R U L E.

Multiply the second and third terms together, and divide the product by the first; the quotient will be the fourth term or answer: in the same name with the second.

### P R O O F.

Invert the question, beginning with the answer; and the result will be the first term; thus the preceding;



## The Single Rule of Three.

$$\text{As } \left\{ \begin{array}{l} s. \text{ yds.} \\ 18 \dots 9 \dots 6 \dots 3 \\ 10 \dots 5 \dots 40 \dots 20 \end{array} \right\} \text{ The first term.}$$

Note. The operation may frequently be contracted by dividing the dividing term, and either of the other two o. c. by the other; or, by any number that will divide them both without remainder, and using their quotients in their stead; cancelling the figures so contracted, as denoted by this/ dash in the two subsequent examples.

Thus, If 24 yards cost 60s. what is 8 yards worth?

$$\begin{array}{r} \text{Yds.} \quad s. \quad \text{yd.} \\ \text{As } 24 \dots 60 \dots : : \$ \\ \hline 3 \quad 20s. \text{ Answer} \\ \text{That is, } 24 \div 8 = 3 \\ \text{and } 60 \div 3 = 20s. \end{array}$$

$$\begin{array}{r} 12) \\ \text{As } 24 \dots 60 \dots : : \$ \\ \hline 2 \quad 5 \\ \quad 8 \\ \hline 2)40 \\ \hline \end{array}$$

Answer 20s.

$$\begin{array}{r} 12) \\ \text{As } 24 \dots 60 \dots : : \$ \\ \hline 2 \quad 5 \quad 4 \\ \quad 4 \\ \hline \text{Answer. } 20s. \end{array}$$

## EXAMPLES.

- 1 If 3oz. of silver cost 17s. what is the value of 48oz?  
Contracted.

$$\begin{array}{r} \text{oz.} \quad s. \quad \text{oz.} \\ \text{If } 3 \dots 17 \dots : : 48 \\ \quad 17 \\ \hline 3)816 \\ \hline 270)2712 \\ \hline \end{array}$$

$$\begin{array}{r} \text{oz.} \quad s. \quad \text{oz.} \\ \text{If } 3 \dots 17 \dots : : 48 \\ \quad 16 \\ \hline 270)2712 \\ \hline \end{array}$$

£. 13 12s.

£. 13 12s. Answer.

- 2 If 8 yards of cloth cost 24s. what will 96 yards come  
Answer 14. 8s.

3 How

3 How many yards of cloth may be bought for 14*l.* 8*s.* when 8 yards cost 24*s*? *Answer* 96 yards.

4 What will 9 yards of cambric cost, at the rate of 44*l.* 16*s.* for 72 yards? *Answer* 5*l.* 12*s.*

5 If 96*lb.* of sugar cost 3*l.* 12*s.* what is it per *lb.* *Answer* 9*d.*

6 What is the value of 1 hundred weight of sugar, at 8*d.* per *lb.* *Answer* 3*l.* 14*s.* 8*d.*

7 At 15*d.* per *lb.* what is loaf sugar per hundred weight? *Answer* 7*l.*

8 What is the price of a barrel of beer, at 16*d.* per gallon? *Answer* 2*l.* 2*s.*

9 If 19 dozen pair of hose cost 5*l.* 6*s.* what is that per pair? *Answer* 4*s.* 6*d.*

10 Sold 3 hundred weight of tobacco, at 18*d.* per *lb.* what is the amount? *Answer* 25*l.* 4*s.*

11 If 1 hundred weight of iron be worth 1*l.* 8*s.* what is the value of 33*C.* 1*qr.* 22*lb.* *Answer* 46*l.* 16*s.* 6*d.*

12 Bought 12 pieces of cloth, each 12 yards, at 10*s.* 6*d.* per yard; what come they to? *Answer* 75*l.* 12*s.*

13 If 360*z.* 10*dwt.* of silver be worth 9*l.* 2*s.* 6*d.* what is that per ounce? *Answer* 5*s.*

14 When a bankrupt compounds with his creditors, at 12*s.* 6*d.* in the pound; what is the merchant's quota, to whom he owes 1000*l*? *Answer* 625*l.*

15 What is tobacco an ounce, when 17*C.* 3*qr.* 17*lb.* sells for 133*l.* 13*s.* 4*d*? *Answer* 1*d.*

16 What quantity of sugar will 23*l.* 10*s.* buy, at 26*s.* 8*d.* per hundred weight? *Answer* 17*C.* 2*qr.* 14*lb.*

17 What do 518*lb.* of tea come to, if 90*lb.* cost 18*l.* and what is it per *lb.* *Answer* 103*l.* 12*s.* at 4*s.* per *lb.*

18 If 17*T.* 12*C.* of iron cost 165*l.* what is that for 2 hundred weight? *Answer* 18*s.* 9*d.*

19 If a man's daily income be 16*s.* 8*d.* how much is that per annum? *Answer* 304*l.* 3*s.* 4*d.*

20 Bought 14 bags of hops, each containing 546*lb.* for 48 English guineas; what was the value of 1*Cwt.* in Pennsylvania currency? *Answer* 1*l.* 4*s.* 7*d.* $\frac{1}{2}$ .

21 What sum will pay for 3 casks of brandy, containing 58, 62 and 65 $\frac{1}{2}$  gallons, at 6*s.* 8*d.* per gallon? *Answer* 61*l.* 16*s.* 8*d.*

22 What

22 What will 4 pieces of cloth come to, containing 23, 24, 25 and 27 yards, at 5*s.* 5*d.* per yard?

*Answer* 26*l.* 16*s.* 3*d.*

23 Bought 4 pieces of linen, two of which contained 26½ yards each, and each of the others 23½ yards; what did they come to, at 2*s.* 8*d.* per yard?

*Answer* 13*l.* 8*s.*

24 A draper bought 242 yards of broad cloth for 25*l.* 10*s.* for 86 yards of which he gave 2*l.* 4*d.* per yard; what was the price per yard of the remainder?

*Answer* 20*s.* 10*d.* ½

25 What must be paid for 53 ells English 1*qr.* of Holland, at the rate of 7*s.* 9*d.* ½ per yard?

*Answer* 25*l.* 18*s.* 1*d.* ½

26 What quantity of sugar may be bought for 26*l.* 10*s.* 4*d.* when the price of 43*C.* 2*qr.* is 159*l.* 2*s.*

*Answer* 7*C.* 1*qr.*

27 A person failing in trade, owes 977*l.* and the inventory of his effects amounts to but 420*l.* 6*s.* 3*d.* ⅓; how much will this produce per pound to his creditors?

*Answer* 8*s.* 7*d.* ½

28 What must be given for a piece of silver weighing 73*lb.* 5*oz.* 15*dwt.* at 5*s.* 9*d.* per ounce?

*Answer* 253*l.* 10*s.* 0*d.* ⅓

29 Bought 3 casks of raisins each weighing 3*C.* 1*qr.* 7*lb.* neat; what will they cost, at 2*l.* 6*s.* 6*d.* per *C.* wt.

*Answer* 23*l.* 2*s.* 1*d.* ⅔

30 What will the tax upon 763*l.* 15*s.* be at the rate of 3*s.* 6*d.* per pound?

*Answer* 133*l.* 13*s.* 1*d.* ⅓

31 How many ells English of Holland may be bought for 25*l.* 18*s.* 1*d.* ⅓ at 7*s.* 9*d.* ½ per yard?

*Answer* 53*E.* 1*qr.*

32 What will 1*qr.* 1*na.* of velvet cost, at 18*s.* 6*d.* per yard?

*Answer* 5*s.* 9*d.* 1*qr.* ⅓

33 A bankrupt compounds with his creditors, for 8*s.* 7*d.* ⅔ per pound, and at that rate pays them 420*l.* 6*s.* 3*d.* ⅓; how much was he indebted?

*Answer* 977*l.*

34 What is the value of a silver tankard, weighing 1*lb.* 7*oz.* 14*dwt.* at 6*s.* 4*d.* per ounce?

*Answer* 6*l.* 4*s.* 9*d.* ⅔

35 What must be paid for 7 casks of prunes, each weighing 2*C.* 1*qr.* 14*lb.* at 2*l.* 19*s.* 8*d.* per *C.* wt.

*Answer* 49*l.* 11*s.* 11*d.* ⅓

36 At

36 At 1*l*. 7*s*. 8*d*. per acre, what is the annual rent of 173 . 2*R*. 14*P*? *Answer* 24*ol*. 2*s*. 7*d*.

37 If 5 yards of cloth cost 14*s*. 2*d*. what must be given for 9 pieces, containing each 21*yds*. 1*qr*. *Ans*. 27*l* 1*s*. 10*d*.  $\frac{1}{2}$

38 If a person's estate be worth 2107*l* 12*s*. a year, what may he spend a day to save 500*l*. annually?

*Answer* 4*l*. 8*s*. 1*d*. +

39 If a man's annual income be 500*l*. and he expend daily 19*s*. 11*d*. what does he save at the year's end?

*Answer* 136*l*. 10*s*. 5*d*.

40 If a staff, 4 feet long, cast a shade (on level ground) 7 feet; what is the height of that steeple, whose shade, at the same time, measures 198 feet? *Answer* 113*ft*.  $\frac{1}{2}$

41 The earth being 360 degrees in circumference, turns round on its axis in 24 hours; how far are the inhabitants at the equator carried in one minute, a degree there being 69  $\frac{1}{2}$  miles?

*Answer* 17*M*. 3*fur*.

42 A merchant would lay out in spices 560*l*. viz. cloves at 4*s*. per *lb*. mace at 7*s*. cinnamon at 3*s*. and nutmegs at 2*s*. and he would have an equal quantity of each sort; what must that quantity be?

700*lb* of each.

43 A goldsmith bought of a merchant 14*lb*. 3*oz*. 8*dwt*. of gold, for 514*l*. 4*s*. what did he pay per ounce?

*Answer* 3*l*.

44 How many reams of paper, at 12*s*. 6*d*. 14*s*. 9*d*. and 17*s*. 4*d* per ream, and of each an equal number, may be purchased with 198*l* 7*s*. 11*d*? *Answer* 89 reams of each.

45 If 9*C* 3*qr*. of sugar cost 27*l*. 17*s*. 6*d*. what will 2*C*. 1*qr*. 11*lb* cost? *Answer* 6*l*. 14*s*. 3*d*.

46 Sold 59*C*. 1*qr*. 14*lb*. of sugar, at 28*s*. 7*d*. per *Cwt*. what is the amount? *Answer* 84*l*. 17*s*. 1*d*.  $\frac{1}{2}$

47 Bought 476*A*. 3*R*. 28*P*. of land, at 3*l*. 7*s*. 11*d*. per acre, the value thereof is required?

*Answer* 1619*l*. 11*s*. 1*d*.  $\frac{3}{4}$

## INVERSE PROPORTION.

Inverse proportion is that in which the third term is greater than the first, and requires the fourth to be less than the second; or, the third less than the first, and requires the fourth to be greater than the second: For, as often



62      *The Single Rule of Three.*

as the third term is greater or less than the first, so many times will the fourth be respectively less or greater than the second. Thus;

$$\text{As } \left\{ \begin{array}{l} \text{Men Days. Men Days.} \\ 4 \dots 6 :: 8 \dots 3 \text{ more requiring less.} \\ \text{In.wd. In.lg. In.wd. In.lg.} \\ 12 \dots 12 :: 3 \dots 48 \text{ less requiring more.} \end{array} \right.$$

R U L E.

Multiply the first and second terms together, and divide the product by the third term; the quotient will be the fourth term, or answer.

P R O O F.

As in direct proportion: Thus;

$$\text{As } \left\{ \begin{array}{l} \text{Days. Men. Days. Men.} \\ 3 \dots 8 :: 6 \dots 4 \\ \text{In.lg. In.wd. In.lg. In.wd.} \\ 48 \dots 3 :: 12 \dots 12 = 1 \text{ foot square.} \end{array} \right.$$

Note. See the last note.

E X A M P L E S.

1 If 48 men can build a wall in 24 days; how many men can do the same in 192 days?

*D. M. D.*

$$\text{As } 24 \dots 48 :: 192$$

24

192

96

Men.

192) 1152 (6 Answer

1152

Contracted

$$\text{As } \cancel{2}4 \dots \cancel{4}8 :: \cancel{1}9\cancel{2}$$

Answer 6 Men. 8

that is,  $192 \div 24 = 8$

and  $48 \div 8 = 6$

2 What quantity of shalloon, that is 3 *qrs.* of a yard wide will line  $7\frac{1}{2}$  yards of cloth, that is  $1\frac{1}{2}$  yard wide?

Answer 15 yds.

3 If 100 men can finish a piece of work in 12 days; how many are sufficient to do it in three days?

Answer 400 men.

4 How much in length, that is  $4\frac{1}{2}$  inches broad, will make a square foot?

Answer 32 inches.

5 How

5 How many yards of matting 2 feet 6 inches broad, will cover a floor that is 27 feet long and 20 broad?

*Answer* 72 yards.

6 How many yards of cloth 3 $\frac{3}{4}$ rs. wide, are equal in measure to 30yds. of 5 $\frac{3}{4}$ rs. wide?

*Answer* 50 yards.

7 If 100*l.* principal in 12 months gain 6*l.* interest, what principal will gain the same in 8 months?

*Answer* 150*l.*

8 How many yards of paper 1 $\frac{1}{4}$  yard wide, will be sufficient to hang a room, which is 20 yards in circumference, and 4 in height?

*Answer* 64 yards.

9 How many men must be employed to finish a piece of work in 15 days, which five men can do in 24 days?

*Answer* 8 men.

10 In how many days will 8 men finish a piece of work, which five men can do in 24 days?

*Answer* 15 days.

11 If a footman perform a journey in 3 days, when the days are 16 hours long, how many days will he require of 12 hours long, to perform the same in?

*Answer* 4 days.

12 If 6 men can reap a field of wheat in 12 days, in what time will 24 men do it?

*Answer* 3 days.

13 How much in length that is 8 poles in breadth, must be taken to contain an acre?

*Answer* 20 perches.

14 A lent B 500*l.* for 6 months, how long ought B to lend A 220*l.* to be equivalent?

*Answer* 13m. 19da.

15 If, when the price of a bushel of wheat is 4*s.* 6*d.* the penny loaf weighs 12oz. what must the penny loaf weigh, when a bushel is worth but 3*s.*

*Answer* 18oz.

16 What is the weight of a pea to a steelyard, which, being suspended 39 inches from the centre of motion, will equipoise 208*lb.* suspended at the draught end 3 quarters of an inch?

*Answer* 4*lb.*

17 Suppose 800 persons in garrison with provision sufficient for two months; how many must depart, that the provision may serve them 5 months?

*Answer* 480.

18 How many yards of matting, that is half a yard wide, will cover a room that is 18 feet wide and 30 long?

*Answer* 120 yards.

19 How wide must a lot of ground be to contain an acre, when it is 13 $\frac{1}{2}$  poles in length?

*Answer* 11*P.* 4yds 2ft. 6in 2*h.c.*

20 *N*



20 If, when the price of a bushel of wheat is 6s. 3d. the penny loaf weighs 9oz. what ought it to weigh, when wheat is at 8s. 2d.  $\frac{1}{2}$  per bushel? *Answer* 6oz. 13dr.

21 In what time will 600l. gain 50l. interest when 80l. would gain it in 15 years? *Answer* 2 years.

### Application.

1 If 3 quarters of a yard of velvet cost 7s. 3d. how many yards can I buy for 13l. 15s. 6d? *Answer* 28yds. 2qr.

2 If an ingot of gold, weighing 9lb. 9oz. 12dwt. be worth 411l. 12s. what is that per grain? *Answer* 1d.  $\frac{3}{4}$

3 A borrowed of B 250l. for 7 months; and in return lends him 300l. how long ought B to keep it, that the interest of it may be equal to that of the first sum?

*Answer* 5mo. 25da.

4 If a person's income be 500 guineas a year, and he spend 19s. 7d. sterling per week: how much will he have saved at the year's end? *Answer* 167l. 12s. 1d. sterling.

5 At 13s. 2d.  $\frac{1}{2}$  per yard, what is the value of a piece of cloth containing 52 English ells and 39grs?

*Answer* 43l. 6s. 5d.  $\frac{1}{2}$

6 If 30 men can perform a piece of work in 11 days: how many men will accomplish another piece of work four times as large, in 12 days? *Answer* 110 men.

7 The rents of a whole parish amount to 1750l. on which is assessed 32l. 16s. 3d. what is that in the pound?

*Answer* 4d.  $\frac{1}{2}$

8 Bought 3 tons of oil for 151l. 14s. 8s. gallons of which being damaged, I desire to know how I may sell the remainder per gallon, so as neither to gain or lose thereby?

*Answer* 4s. 6d.  $\frac{1}{2}$

9 If the carriage of 5C. 14lb. for 96 miles be 32s. 6d. how far may I have 3C. 17qr. carried for the same money?

*Answer* 151M. 3fur. 3P.

10 Bought 200 yards of cambric for 90l. which being damaged, am willing to lose 7l. 10s. by the whole, at what rate then must it sell per ell English? *Answer* 10s. 3d.  $\frac{1}{2}$

11 If for 48s. 225C. be carried 512 miles, how many hundred weight may be carried 64 miles for the same money?

*Answer* 1800C.

12 Bought

12 Bought a parcel of cloth, at the rate of 6s. 6d. for every two yards, of which a certain quantity was sold at the rate of 18s. 9d. for every five yards, and gained thereby as much as 180 yards cost; how many yards were sold?

*Answer* 1170 yards.

13 A certain steeple projected upon level ground a shadow to the distance of 633ft. 4in. when a staff, 3 feet in length, perpendicularly erected, cast a shadow of 6ft. 4in. from hence the height of the steeple is required?

*Answer* 100 yards.

14 If 12 yards of yard wide stuff exactly line 8 yards of silk of another breadth; how many yards of the latter will line 24 pieces of the former, each piece containing 20 yards?

*Answer* 320 yards.

15 Laid out 100*l.* upon serges and shalloons; the value of the shalloons was 60*l.* and the quantity of serge 237 yards; also for every two yards of serge there were three of shalloon; how many yards of shalloon were there, and what was the value of one yard of each sort?

*Answer* 355½yds. shalloon, 3s. 4d. ½ each per yard.

16 How many pieces of Holland, each 33 ells Flemish, 1*qr.* 2*na.* may be had for 118*l.* 17s. 7d. ½ when 4 ells English cost 1*l.* 7s. 10d? *Answer* 16 pieces 33 ells 1*qr.* 1*na.*

17 A factor bought 64 pieces of Holland, which cost him 352*l.* at 5s. 6d. per ell Flemish; how many yards were there in all, and how many ells English in each piece?

*Answer* 960yds 12 ells each piece.

18 If a pole, perpendicular to the horizon, of 50ft. 11in. in length, when the sun is on the meridian, cast a shadow 98ft. 6in. long; what is the breadth of a river, that, running due east and west within 20ft. 6in. on the north side of the foot of a steeple, 300ft. 8in. high, which at the same time casts the extremity of its shadow 30ft. 9in. beyond the stream?

*Answer* 176yds. 2ft. 4in.

19 Of what length must a board be, that is 7½in. wide, to measure 20 square feet?

*Answer* 32 feet.

20 A and B depart from the same place, and travel the same road; but A goes 5 days before B, at the rate of 20 miles a day; B follows at the rate of 25 miles a day; in what time and at what distance will he overtake A?

*Answer* 20 days and 500 miles.

2 Suppose 4 men in 12 days mow 48 acres; how many acres can 8 men mow in 16 days? *Answer* 128 acres.

3 If 12 oxen in 16 days eat 20 acres of grass; how many acres will serve 24 oxen 48 days? *Answer* 120 acres.

4 If 10 bushels of oats be sufficient for 18 horses 20 days; how many bushels will serve 60 horses 36 days, at that rate? *Answer* 60 bushels.

5 If 56*lb.* of bread be sufficient for 7 men 14 days; how many pounds will suffice 21 men 3 days? *Answer* 36*lb.*

6 If 8 men have 3*l.* 4*s.* for 4 days work; how much ought 48 men to receive for 16 days? *Answer* 7*l.* 16*s.*

7 If 700*l.* in half a year raise 14*l.* interest; what will be the interest of 400*l.* for 5 years? *Answer* 80*l.*

8 If 112 acres of grass be mowed by 16 men in 7 days; how many acres may 24 men mow in 19 days?

*Answer* 456 acres.

9 If 16*l.* 18*s.* be the wages of 16 men for 8 days; what sum will 32 men earn in 24 days? *Answer* 101*l.* 8*s.*

10 If 7*l.* in 9 months amount to 7*l.* 7*s.* 6*d.* at what rate per cent. is the interest computed? *Answer* 6*l.* per cent.

11 Suppose the wages of 6 persons for 21 weeks be 120*l.* what will be the hire of 14 persons for 46 weeks?

*120* *5* *21* *14* *46*

*Answer* 613*l.* 6*s.* 8*d.*

12 What is the interest of 259*l.* 13*s.* 5*d.* for 20 weeks, at 5 per cent?

*Answer* 4*l.* 19*s.* 10*d.* 4.

13 If 2 men can do 12 rods of ditching in 6 days; how many rods may be done by 8 men in 24 days?

*Answer* 192 rods.

14 If the carriage of 8*C.*wt. 128 miles cost 48 shillings; what must be paid for the carriage of 4*C.*wt. 32 miles?

*Answer* 6*s.*

15 If 200*lb.* be carried 40 miles for 3 shillings; how much must be paid at that rate for the carriage of 20200*lb.* 60 miles?

*Answer* 22*l.* 14*s.* 6*d.*

16 If the freight of 9 hogsheads of sugar, each weighing 12 hundred weight, for 20 leagues, cost 16*l.* what must be paid for the freight of 50 casks of ditto, each weighing 2½ hundred weight, 100 leagues?

*Answer* 92*l.* 11*s.* 10*d.*

**I N V E R S E**



1 If 3 men in 4 days eat 5 lb. of bread, how much will suffice 6 men for 12 days?

$$\begin{array}{l} \text{If } 3m. \} \\ \quad 4d. \} \end{array} \quad \begin{array}{l} 5lb. \\ \end{array} \quad \begin{array}{l} \} 6m. \\ \} 12da. \end{array}$$

2 If 3 men eat 5 lb. in 4 days; in how many days will 6 men consume 30 lb.

$$\begin{array}{l} \text{If } 3m. \} \\ \quad 5lb. \} \end{array} \quad \begin{array}{l} 4da. \\ \end{array} \quad \begin{array}{l} \} 6m. \\ \} 30lb. \end{array}$$

To know whether the stating be direct or inverse: Consider the upper pair of extremes, and the lower, each separately with the middle term, as a stating of the single rule, and try them as taught in that rule: if both lines be direct, the stating is in direct proportion; but of inverse, if either pair of the extremes be so. Thus, the first example above is direct, and the second inverse.

# DIRECT PROPORTION.

## R U L E.

Divide the continual product of the two last extremes and middle term by that of the two first, and the quotient will be the sixth term, or answer.

## P R O O F.

By two statings of the single rule of three.

Note. If either of the two first terms, or both, will divide, or can be divided by any of the three last, or by any other number without remainder, the operation may be abbreviated by cancelling them and using their quotients or aliquot parts in their stead.

## E X A M P L E S.

1 If 3 men in 4 days eat 5 lb. of bread; how much will suffice 6 men for 12 days?

		Contracted.	
If 3m. }	{ 6m.	If 3m. }	{ 6m. (2
4d. }	{ 12d.	4d. }	{ 12d. (3
5lb.		5lb.	
<hr/>		<hr/>	
12	72	6	
<hr/>	5	5	
	<hr/>		<hr/>
	12)360		30lb.
	<hr/>		<hr/>

Answer 30 lb.

7 If a footman, when the days are 14 hours long, can travel 276 miles, in 16 days; in how many days can he travel 852 miles, when the days are but 12 hours long?

$276 \dots 16 \dots 482$   
 $852 \dots 12 \dots 12$   
*Answer* 57 days 7 hours. +

8 If 15 men eat 3 shillings worth of bread in 6 days, when wheat is sold at 9 shillings per bushel; how many days will 30 men require to eat 13s. 4d. worth, when wheat is at 6s. per bushel?

*Answer* 20 days.

9 If 100l. principal in 12 months gain 8l. interest; what principal will gain 8l. 12s. in 5 months?

*Answer* 258l.

10 Suppose 100l. will defray the expences of 5 men for 22 weeks and 6 days; how long will 12 men be spending 150l.

*Answer* 14 weeks 2 days.

$100 \dots 22 \cdot 6 \dots 150$   
*Application.*

1 If 7 bushels of malt be sufficient for 7 persons 4 months; how many bushels will serve 46 persons 10 months?

*Answer* 115 bushels.

2 How many men must be employed to reap 240 acres in 12 days, if 36 men can reap 60 acres in 5 days?

*Answer* 60 men.

3 If 5 men make 300 pair of shoes in 40 days; how many men may make 900 pair in 60 days?

*Answer* 10 men.

4 A porter having received 42 shillings for the carriage of 3C. wt. 150 miles; how much ought he to have for the conveyance of 7C. 2qr. 14lb. 50 miles?

*Answer* 35s. 7d.

5 A person having engaged to remove 8000C. wt. a certain distance in 9 days, with 18 horses in 6 days he removed 4500C. wt. how many horses will be required to remove the remainder in the remaining 3 days?

*Answer* 28 horses.

6 If 20 hundred weight be carried 50 miles for 5l. how much will 40 hundred weight cost, to be conveyed 100 miles?

*Answer* 20l.

7 A farmer having sown 48 bushels, found that it produced 576 bushels the first year; now, supposing he sows 240 bushels of grain each year for 6 years successively; what will be his whole increase at the expiration of the last year?

*Answer* 17280 bushels.

8 If 12 men in 6 days reap 80 acres; in how many days will 25 men reap 200 acres?

*Answer.*  $7\frac{1}{2}$  days.

9 An

9 An usurer put out 86*l.* to receive interest for the same; and when it had continued 8 months, he received for principal and interest 88*l.* 17*s.* 4*d.* query the rate per cent?

86 .. 2 = 17.4  $\frac{100}{17}$  Answer 5 per cent.

## PRACTICE.

**P**RACTICE is a short method of finding the value of any quantity of goods, by the given price of an integer.

Note. See the rules in the several cases under this head.

## P R O O F.

Practice may be proved by varying the parts; by compound multiplication; or, by the single rule of three direct.

## T A B L E S.

<i>gr.</i>		<i>s. d.</i>		<i>lb.</i>	
1 =	$\frac{1}{20}$	1 0 =	$\frac{1}{20}$	7 =	$\frac{1}{10}$
2 =	$\frac{1}{10}$	1 8 =	$\frac{1}{12}$	8 =	$\frac{1}{12}$
<i>d.</i>		2 0 =	$\frac{1}{10}$	14 =	$\frac{1}{8}$
1 =	$\frac{1}{12}$	2 6 =	$\frac{1}{8}$	16 =	$\frac{1}{7}$
1 $\frac{1}{2}$ =	$\frac{1}{8}$	3 4 =	$\frac{1}{6}$	28 =	$\frac{1}{4}$
2 =	$\frac{1}{6}$	4 0 =	$\frac{1}{5}$	56 =	$\frac{1}{2}$
3 =	$\frac{1}{4}$	5 0 =	$\frac{1}{4}$		
4 =	$\frac{1}{3}$	6 8 =	$\frac{1}{3}$		
6 =	$\frac{1}{2}$	10 0 =	$\frac{1}{2}$		

## C A S E 1.

When the price of an integer is less than a penny;

## R U L E.

Take such aliquot part or parts of the given quantity, as the price is of a penny, for the answer in pence; which reduce to pounds.

Note 1. When the complement of the given price, in any case, is an aliquot part, deduct the said aliquot part of the given quantity therefrom, and the remainder will be the answer of the same denomination with the integer, of which the divisor is a part.

2. When a remainder occurs in any example, either in this or the following cases, let it be reduced to the next lower denomination, &c.

## E X A M P L E S.



## EXAMPLES.

1	7612 lb. at $\frac{1}{4}$ per lb. and at $\frac{1}{2}$ .	
	$\frac{1}{4}$	$\frac{1}{2}$
	$\frac{1}{4}$	$\frac{1}{2}$
	12	19 0 3
	20	1 5 8 7
		210) 4 7 5 9
		23 15 9
	Facit £. 7 18 7	

2	6812 at $\frac{1}{2}$	Facit £. s. d.
3	4712 at $\frac{3}{4}$	14 3 10
4	15344 at $\frac{1}{4}$	14 14 6
5	7672 at $\frac{1}{2}$	15 19 8
6	9424 at $\frac{3}{4}$	29 9 0

## CASE 2.

When the given price of an integer is a penny, or more, but less than a shilling;

## RULE.

Take such part or parts of the given quantity, as the price is of a shilling, for the answer in shillings.

## EXAMPLES.

1	7612 yards, at 1d. per yard, and at 11d.	
	$\frac{1}{12}$	$\frac{1}{12}$
	$\frac{1}{12}$	$\frac{1}{12}$
	210	6 3 4 4
		210) 6 9 7 7 8
	Facit £. 31 14 4	£. 348 17 8

2	8612 at $1\frac{1}{2}$ d.	Facit £. s. d.
3	1218 at $2\frac{1}{2}$	44 17 1
4	7812 at $3\frac{1}{2}$	12 13 9
5	8120 at 4	122 1 3
6	8121 at $5\frac{1}{2}$	135 6 8
		177 12 11 12

		<i>d.</i>	<i>Facit</i>	<i>£.</i>	<i>s.</i>	<i>d.</i>
7	1218 at	$6\frac{1}{2}$		32	19	9
8	6120 at	$7\frac{3}{4}$		197	12	6
9	7100 at	8		236	13	4
10	4121 at	$9\frac{1}{4}$		158	16	$7\frac{1}{4}$
11	1002 at	$10\frac{1}{2}$		43	16	9
12	2345 at	$11\frac{3}{4}$		114	16	$1\frac{3}{4}$
13	6002 at	$4\frac{1}{2}$	}	112	10	9
14	3001 at	9				
15	7182 at	5		149	12	6
16	3591 at	10				
17	6128 at	$5\frac{1}{2}$		140	8	8
18	3064 at	11				

## C A S E 3.

When the given price of an integer is more than one ling, and less than two;

## R U L E.

Let the given quantity stand for so many shillings, to which add the amount in shillings of said quantity at the surplus price, found by case 1 or 2, for the answer in shillings.

## E X A M P L E S.

1 486 gallons, at  $12d.\frac{1}{4}$  per gallon.

$\frac{1}{4}$	$\frac{1}{4}$	486
	12	$121\frac{1}{2}$
		$101\frac{1}{2}$
2 0		$4961\frac{1}{2}$

*Facit* £. 24 10

	<i>d.</i>	<i>Facit</i>	<i>£.</i>	<i>s.</i>	<i>d.</i>
2	6100 at $13\frac{1}{2}$		343	2	6
3	1210 at $14\frac{1}{2}$		74	7	$5\frac{1}{2}$
4	1260 at 15		78	15	0
5	7121 at $16\frac{1}{4}$		482	3	$0\frac{1}{4}$
6	2340 at $17\frac{1}{2}$		170	12	6
7	7890 at $18\frac{1}{2}$		616	8	$1\frac{1}{2}$

G

8 8900

## EXAMPLES.

1	7612 lb. at $\frac{1}{4}$ per lb. and at $\frac{1}{2}$ .	
	$\frac{1}{4}$	$\frac{1}{2}$
	$\frac{1}{4}$	$\frac{1}{2}$
	12	19 0 3
	20	15 8 7
	Facit £. 7 18 7	
		7 6 1 2
		1 9 0 3
		12) 5 7 0 9
		2) 0 4 7 5 9
		£. 23 15 9

2	6812 at $\frac{1}{2}$	Facit £. s. d.
3	4712 at $\frac{3}{4}$	14 3 10
4	15344 at $\frac{1}{4}$	14 14 6
5	7672 at $\frac{1}{2}$	15 19 8
6	9424 at $\frac{3}{4}$	29 9 0

## CASE 2.

When the given price of an integer is a penny, or more, but less than a shilling;

## RULE.

Take such part or parts of the given quantity, as the price is of a shilling, for the answer in shillings.

## EXAMPLES.

1	7612 yards, at 1d. per yard, and at 11d.	
	$\frac{1}{12}$	$\frac{1}{12}$
	$\frac{1}{12}$	$\frac{1}{12}$
	20	6 3 4 4
	Facit £. 31 14 4	
		7 6 1 2
		$\frac{1}{12}$ = 6 3 4 4
		2) 0 6 9 7 7 8
		£. 348 17 8

	d.	Facit £. s. d.
2	8612 at $1\frac{1}{2}$	44 17 1
3	1218 at $2\frac{1}{2}$	12 13 9
4	7812 at $3\frac{1}{2}$	122 1 3
5	8120 at 4	135 6 8
6	8121 at $5\frac{1}{2}$	177 12 11

	<i>d.</i>	<i>Facit</i>	<i>£.</i>	<i>s.</i>	<i>d.</i>
7	1218 at $6\frac{1}{2}$		32	19	9
8	6120 at $7\frac{3}{4}$		197	12	6
9	7100 at 8		236	13	4
10	4121 at $9\frac{1}{4}$		158	16	$7\frac{1}{4}$
11	1002 at $10\frac{1}{2}$		43	16	9
12	2345 at $11\frac{1}{4}$		114	16	$1\frac{1}{4}$
13	6002 at $4\frac{1}{2}$	}	112	10	9
14	3001 at 9				
15	7182 at 5		149	12	6
16	3591 at 10				
17	6128 at $5\frac{1}{2}$	}	140	8	8
18	3064 at 11				

## C A S E 3.

When the given price of an integer is more than one shilling, and less than two;

## R U L E.

Let the given quantity stand for so many shillings, to which add the amount in shillings of said quantity at the overplus price, found by case 1 or 2, for the answer in shillings.

## E X A M P L E S.

1 486 gallons, at  $12d.\frac{1}{4}$  per gallon.

$\frac{1}{4}$	$\frac{1}{4}$	4 8 6
	12	1 2 1 $\frac{1}{2}$
		1 0 1 $\frac{1}{2}$
	2 0	49 6, 1 $\frac{1}{2}$

*Facit* £. 24 10

	<i>d.</i>	<i>Facit</i>	<i>£.</i>	<i>s.</i>	<i>d.</i>
2	6100 at $13\frac{1}{2}$		343	2	6
3	1210 at $14\frac{1}{2}$		74	7	$3\frac{1}{2}$
4	1260 at 15		78	15	0
5	7121 at $16\frac{1}{4}$		482	3	$0\frac{1}{4}$
6	2340 at $17\frac{1}{2}$		170	12	6
7	7890 at $18\frac{1}{4}$		616	8	$1\frac{1}{4}$

G

8 8900

	d.	£.	s.	d.
8	8900 at 19	<i>Facit</i> 704	11	8
9	7120 at $20\frac{1}{4}$	600	15	0
10	2100 at $21\frac{1}{2}$	188	2	6
11	6812 at $22\frac{1}{4}$	645	14	5
12	9999 at $23\frac{1}{4}$	989	9	$8\frac{1}{2}$
13	19998 at $23\frac{1}{4}$	1978	19	$4\frac{1}{2}$
14	12345 at 14	720	2	6
15	9876 at $17\frac{1}{2}$			
16	7910 at $19\frac{1}{2}$			
17	6780 at $22\frac{1}{4}$	642	13	9

C A S E 4.

When the given price of an integer is any number of shillings under 20;

## R U L E.

Multiply the quantity by the price for the answer in shillings; or,

If the price be even shillings, multiply by half the price and double the first figure of the product for shillings, the rest of the product will be pounds; or,

Work by aliquot parts.

## E X A M P L E S.

1 486 bushels at 2s. per bushel.

486	486	s.	
2	1	2	$\frac{1}{10}$
2   0   97   2	48l. 12s.	486	48l. 12s.

*Facit* 48l. 12s.

	s.	£.	s.	d.
2	121 at 3	<i>Facit</i> 18	3	0
3	47 at 5	117	15	0
4	19 at 8	76	8	0
5	24 at 11	133	2	0
6	600 at 13	390	0	0
7	171 at 16	136	16	0
8	100 at 19	95	0	0
9	612 at 9	275	8	0
10	306 at 18			
11	860 at 7	301	0	0
12	430 at 14			

## CASE 5.

When the given price of an integer is shillings and pence, or shillings, pence and farthings;

## RULE.

Take such aliquot part or parts of the given quantity, as the price is of a pound; or,

Multiply by the shillings, and take parts for the rest.

## EXAMPLES.

I 7150 yards, at 1s. 8d. per yard.

s.	d.		s.	d.	
1	8	$\frac{1}{15}$	6	$\frac{1}{2}$	7150
		7150	2	$\frac{1}{3}$	3575
					11918
Facit £. 595 16 8					
			20		119168

£. 595 16 8 Proof

	s.	d.		£.	s.	d.
2	569	at 2	6	Facit	71	2 6
3	69	at 3	4		11	10 0
4	478	at 6	8		159	6 8
5	400	at 13	4		266	13 4
6	789	at 16	8		657	10 0
7	765	at 5	9		219	18 9
8	841	at 13	2		553	13 2
9	807	at 16	5		662	8 3
10	969	at 19	11		964	19 3
11	244	at 5	8 $\frac{1}{2}$		69	12 10
12	875	at 1	4 $\frac{1}{2}$		61	1 4
13	7524	at 3	5 $\frac{1}{2}$		1301	0 6
14	3715	at 9	4 $\frac{1}{2}$		1752	3 6
15	2572	at 13	7 $\frac{1}{2}$			
16	5144	at 6	9 $\frac{1}{2}$			
17	4567	at 19	11 $\frac{1}{2}$			
18	9134	at 9	11 $\frac{1}{2}$			
					4557	9 8 $\frac{1}{2}$

## CASE 6.

When the price of an integer is pounds, or pounds, shillings, &c.

## RULE.



## R U L E.

Multiply the quantity by the pounds, and with the product add the amount at the remaining part of the price, found as before: Or,

Multiply the quantity by the shillings of the price, and take parts for the rest.

## E X A M P L E S.

1 428 tons, at 3*l.* 4*s.* 6*d.*  $\frac{1}{2}$  per ton:

<i>s.</i>			
4	$\frac{1}{2}$	428	
		3	
<hr/>			
<i>d.</i>		1284	
6	$\frac{1}{4}$	85	12
$\frac{1}{2}$	$\frac{1}{8}$	10	14
		17	10

Facit £. 1381 3 10

	428
	64
<hr/>	
	1712
	2568
<hr/>	
	27392
$\frac{1}{2}$	= 214
$\frac{1}{4}$	= 17 10

2|0)2762|3 10

£. 1381 3 10

		£.	<i>s.</i>	<i>d.</i>
2	26 at	11	14	0
3	36 at	5	13	0
4	47 at	3	3	4
	156 at	3	6	8
	78 at	6	13	4
	457 at	17	9	$\frac{1}{2}$
	914 at	7	8	$10\frac{1}{4}$
9	500 at	12	19	$11\frac{1}{2}$
10	1000 at	6	9	$11\frac{1}{4}$

	£.	<i>s.</i>	<i>d.</i>
Facit	304	4	0
	203	8	0
	148	16	8
	520	0	0
	6804	10	$9\frac{1}{2}$
	6498	19	2

## C A S E. 7.

When both the price of an integer, and the quantity, are of divers denominations;

## R U L E.

Multiply the price by the integers of the quantity, and of the price for those of the integer.

## E X A M P L E S.

### EXAMPLES.

1	17 C. 3qr. 19 lb. of sugar at 2l. 2s. 6d. per C. wt.
qr.	£. s. d.
2	2 2 - 6 × 5
	12 + 5 = 17. Or, 4 × 4 + 1 = 17
	25 10 0
	10 12 6
1	1 1 3
16 lb.	10 7 $\frac{1}{4}$
2	6 0 $\frac{3}{4}$
1	9
	4 $\frac{1}{2}$

*Facit* £. 38    1    6 $\frac{3}{4}$ +

	C.	qr.	lb.	℥.	s.	d.		℥.	s.	d.	
2	12	2	14	at	3	14	0	<i>Faint</i>	46	14	3
3	37	2	14	at	7	10	9		283	11	11½
4	9	2	26	at	4	10	4½		43	19	6
5	5	2	10	at	2	18	6½		16	7	2¼
6	59	1	14	at	1	8	7		84	17	1½
7	72	3	27	at	8	11	5		625	11	10
8	0	2	14	at	3	7	6		2	2	2¼
9	0	0	24	at	4	17	0		1	0	9¼
10	0	0	17	at	3	5	4		0	9	11
<hr/>											
	lb.	oz.	dwt.	gr.	℥.	s.	d.				
11	27	10	0	0	at	0	1	4 per lb.	1	17	1½
12	13	10	12	8	at	4	7	6	60	14	10½
13	0	17	6	16	at	3	16	8 per oz.	66	8	10½

	<i>Tds.</i>	<i>qr.</i>	<i>s.</i>	<i>d.</i>					
14	67	2	at	12	2	per	<i>yd.</i>	41	1 3
15	68	1	at	8	1			27	11 8½
16	419	3	at	12	6				
17	839	2	at	6	3			262	6 10½
	<i>A.</i>	<i>R.</i>	<i>P.</i>	<i>£.</i>	<i>s.</i>	<i>d.</i>			
18	476	3	28	at	3	7	11 per <i>A.</i>		
19	953	3	16	at	1	13	11½	1619	11 1½

## Application



26 If Land be rated at *5l. 17s. 6d.* per acre; what is the value of a plantation, containing *1157½* acres?

*Answer 6800l. 6s. 3d.*

27 Bought 7 casks of wine, each containing *84 gals. 1qt.* at *11s. 3d.* per gallon; what did they amount to?

*Answer 331l. 14s. 8½*

28 If a yard of cloth cost *39s. 4d.* what is the value of *139yds. 3qr?*

*Answer 274l. 16s. 10d.*

29 Sold *279½* yards of superfine scarlet cloth, at *3l. 18s. 8d.* per per yard; what did it amount to?

*Answer 1099l. 7s. 4d.*

30 What cost *3qr. 2na.* of velvet at the rate of *17s. 6d.* per yard?

*Answer 15s. 3d. ½*

31 What will 12 ounces of silk cost, if *1lb.* cost *3l. 10s.*

*Answer 2l. 12s. 6d.*

## TARE AND TRETT.

**T**ARE and trett are allowances made by the seller to the buyer, on some particular commodities.

Tare is the weight of the barrel, box, bag, or whatever contains the goods; and is either,

*First,* At so much in the whole gross weight:

*Second,* At so much per box, bag, &c. or,

*Third,* At so much per hundred weight.

Trett is an allowance for waste and dust, of *4lb.* in every *104lb.*

Gross is the weight of the goods, together with that in which they are contained.

Neat is the weight of the goods, after all allowances are deducted.

## CASE 1.

When the tare is so much in the whole gross weight;

## RULE.

Subtract the tare from the gross, the remainder will be the neat.

## EXAMPLES.

1 What is the neat weight of 24 hogshheads of tobacco, each weighing *6C. 2qr. 17lb.* gross, tare in the whole *17C. 3qr. 27lb.* and how much is it worth, at *1l. 10s. 6d.* per *C. wt?*

<i>C. qr. lb.</i>	<i>qr.</i>	<i>£. s. d.</i>
6 2 17	2 $\frac{1}{2}$	1 10 6 $\times 9$
$4 \times 6 = 24$		11
<hr/> 26 2 12		<hr/> 16 15 6
6		12
<hr/> 159 2 16 grofs.		<hr/> 201 6 0
17 3 27 tare.	<i>lb.</i>	13 14 6
<hr/> 141 2 17 neat.	$14 = \frac{1}{4}$	15 3
	2 $\frac{1}{2}$	3 9 $\frac{3}{4}$
	1 $\frac{1}{2}$	6 $\frac{1}{2}$
		<hr/> 3 $\frac{1}{2}$
	Amount	216 0 4 $\frac{1}{2}$

2 What is the neat weight of 456*C.* 1*qr.* 19*lb.* of tobacco, tare in the whole 15*C.* 2*qr.* 13*lb.* and what is the amount thereof at 1*l.* 15*s.* 8*d.* per *C.wt.*?

*Answer* neat 440*C.* 3*qr.* 6*lb.* amount 786*l.* 1*s.* 11*d.*  $\frac{1}{4}$

3 How much is the neat weight of 38 hogshheads of tobacco, weighing grofs 201*C.* 3*qr.* 12*lb.* tare in the whole 3140*lb.* and what does it come to, at 1*l.* 17*s.* 6*d.* per *C.wt.*

*Answer* neat 173*C.* 3*qr.* 8*lb.* value 325*l.* 18*s.* 3*d.*  $\frac{1}{2}$

4 What is the neat weight of 5 casks of sugar, weighing as follow, viz N<sup>o</sup>. 1, 4*C.* 2*qr.* 14*lb.* grofs, tare 21*lb.* N<sup>o</sup>. 2, 3*C.* 0*qr.* 17*lb.* grofs, tare 18*lb.* N<sup>o</sup>. 3, 5*C.* 3*qr.* 10*lb.* grofs, tare 1*qr.* 11*lb.* N<sup>o</sup>. 4, 6*C.* 1*qr.* 16*lb.* grofs, tare 27*lb.* N<sup>o</sup>. 5, 3*C.* 2*qr.* 18*lb.* grofs, tare 19*lb.*; And, the neat of the three first at 2*l.* 4*s.* 7*d.* per *C.wt.* of the other two at 2*l.* 17*s.* 6*d.* what do they amount to?

*Answer* neat 22*C.* 2*qr.* 7*lb.* amount 56*l.* 10*s.* 5*d.*  $\frac{1}{4}$

## C A S E 2.

When the tare is at so much per barrel, box, bag, &c.

## R U L E.

Multiply the number of bags, boxes, &c. by the tare, subtract the product from the grofs, and the remainder will be the neat.

## E X A M P L E S.



## E X A M P L E S.

1 What is the neat weight of 12 casks of raisins, each weighing 3*C.* 2*qr.* 10*lb.* grofs, tare 20*lb.* per cask; and what is the value thereof, at 2*l.* 14*s.* 0*d.* per *C.wt.*

<i>C.</i>	<i>qr.</i>	<i>lb.</i>	<i>lb.</i>	<i>qr.</i>	$\frac{1}{2}$	<i>£.</i>	<i>s.</i>	<i>d.</i>	
3	2	10	20	2	$\frac{1}{2}$	2	14	0	
		12	12					4	
<hr/>			<hr/>		<hr/>	<hr/>			
43	0	8	28	240		10	16	0	
2	0	16	tare.	224				10	
<hr/>			<hr/>			<hr/>			
40	3	20	neat,	16		108	0	0	
<hr/>			<hr/>		<hr/>	<hr/>			
				1		1	7	0	
				16 <i>lb.</i>			13	6	
				4			7	8 $\frac{1}{2}$	
<hr/>			<hr/>			<hr/>			
							1	11	

Amount *£.* 110 10 1 $\frac{1}{2}$

2 In 70 bales of silk, each 317*lb.* grofs; tare per bale 16*lb.* how many pounds neat, and what do they amount to, at 12*s.* 6*d.* per *lb.*?

*Answer* neat 21070*lb.* amount 13168*l.* 15*s.*

3 What is the neat weight and value of 16 hogsheds of tobacco, weighing 86*C.* 2*qrs.* 14*lb.* grofs, tare 100*lb.* per hogshed; the neat sold at 3*l.* 15*s.* 10*d.* per *C.wt.*?

*Answer* neat 72*C.* 1*qr.* 10*lb.* value 274*l.* 5*s.* 8*d.*  $\frac{3}{4}$

4 Sold 4 casks of indigo, weighing grofs 18*C.* 2*qr.* tare 37*lb.* per cask; what is the neat weight, and value thereof, at 4*s.* 6*d.* per *lb.*

*Answer* neat 17*C.* 20*lb.* value 432*l.* 18*s.*

## C A S E 3.

When the tare is at so much per hundred weight;

## R U L E.

Deduct from the grofs such aliquot part or parts of it, as the tare is of an *C.wt.* the remainder will be the neat. Or

Multiply the pounds grofs by the tare per *C.wt.* and divide the product by 112, the quotient will be the tare; which deduct as before.

E X A M P L E S.



## EXAMPLES.

1 In 12 butts of currants, each 7C. 1qr. 10lb. tare per C.wt. 16lb. how much neat; and what does it come to, at 3l. 7s. 4d. per C.wt.?

C. qr. lb.			£. s. d.		
7	1	10	1qr $\frac{1}{4}$	3	7 4 $\times 3$
		12	16lb. $\frac{1}{7}$		8
16 $\frac{2}{7}$	88	0 8 grofs.		26	18 8
	12	2 9 tare.			9
	75	1 27 neat		242	8 0
				10	2 0
				16	10
			8 $\frac{1}{2}$	9	7 $\frac{1}{2}$
			2 $\frac{3}{4}$	4	9 $\frac{1}{2}$
			3 $\frac{1}{2}$	1	2 $\frac{3}{4}$
				0	7
			£.	254	3 0 Amount.

2 What is the neat weight and value of 40 kegs of figs, grofs 75C. 3qr. 14lb. tare per hundred weight 14lb. at 18s. 6d. per C.wt.?

*Answer* neat 66C. 1qr. 16lb. value 61l. 8s. 3d.

3 Sold 9 hogsheds of sugar, each 6C. 2qr. 12lb. grofs, tare per hundred weight 17lb. what is the neat weight; And, what does it amount to, at 2l. 12s. 6d. per C.wt.?

*Answer* neat 50C. 1qr. 22lb. amount 132l. 8s. 5d.  $\frac{1}{2}$

4 Bought 4 hogsheds of sugar, weighing 43C. 3qr. 21lb. grofs, tare 12lb. per C.wt. required the neat weight and its value, at 2l. 15s. 4d. per C.wt.?

*Answer* neat 39C. 25lb. 12oz. value 108l. 10s. 7d.  $\frac{1}{2}$

## CASE 4.

When trett is allowed with tare;

## RULE.

*Deduct the tare as before, the remainder is called futtle, which divide by 26, the quotient will be the trett; subtract this from the futtle, and the remainder will be the neat.*

## EXAMPLES.

1 In 27 bags of coffee, each 2C. 3q. 17lb. gross, tare 13lb. per C.wt. trett 4lb. per 104lb. what is the neat weight; and what is its value, at 3l. 18s. 9d. per C.wt.?

lb.	lb.	lb.
8775 gross.	8775	26)7757(298 trett.
1018 tare.	13	52
<hr/>		
7757 futtle. 112)	114075(1018 tr.	255
298 trett.	112	234
<hr/>		
Neat 7459=66 2 11	207	217
	112	208
<hr/>		
Value 262l. 4s. 7d.		
	955	9
	896	
	<hr/>	
	59	
	<hr/>	

2 In 8C. 3qr. 20lb. gross, tare 38lb. trett 4lb. in every 104lb. how many pounds neat; and what do they come to, at 8d.  $\frac{1}{2}$  per lb.? Answer neat 925lb. value 32l. 15s. 2d.  $\frac{1}{2}$

3 Bought 120C. 2qr. gross of sugar, tare 176lb. trett 4lb. per 104lb. what is the neat weight, and its value, at 2l. 3s. 8d. per C.wt.?

Answer neat 114C.wt. 1qr. 12lb. value 249l. 13s. 6d.  $\frac{1}{2}$

4 Sold 177C. 22lb gross, tare 9lb. per C.wt. trett 4lb. per 104lb. required the neat weight, and its amount at 3l. 14s. per C.wt.?

Answer neat 156C. 2qr. 22lb. amount 579l. 15s. 6d.  $\frac{1}{2}$

## I N T E R E S T.

**I**NTEREST is a consideration allowed for the use of money; relative to which are four particulars, viz.

*First,* The principal, or sum at interest.

*Second,* The time the principal is at use.

*Third,* The rate, or interest of 100l. for one year.

*Fourth,* The amount, which is the sum of the principal and interest.

Interest is either simple or compound.

## SIMPLE INTEREST.

Simple Interest is that which arises from the principal only.

## C A S E I.

When the time is any number of years, and the rate per cent. pounds only;

## R U L E.

Multiply the principal by the rate per cent. and divide the product by 100, the quotient will be the interest for one year; which multiply by the years given.

## P R O O F.

By the double rule of three: or, it may be proved or calculated practically thus; for the yearly interest at five per cent. take  $\frac{1}{20}$  of the principal, and increase or diminish it by proportional parts thereof for any other rate: As,

		2½ per cent. take $\frac{1}{8}$		} of said interest at 5 per cent.	} From said interest.
For	3	-	$\frac{1}{2} + \frac{1}{10}$		
	3½	-	$\frac{1}{2} + \frac{1}{5}$		
	4	-	Subtract $\frac{1}{5}$		
	4½	-	$\frac{1}{10}$		
	5½	-	Add $\frac{1}{10}$		
	6	-	$\frac{1}{5}$		
	6½	-	$\frac{1}{5} + \frac{1}{10}$		
		7	-	$\frac{1}{5} + \frac{1}{5}$	} To said interest.

Then, multiply the yearly interest by the number of years, and take the parts for the odd time.

## E X A M P L E S.

1 What is the interest of 500*l.* for one year, at 6 per cent. per annum? Also, at all the other preceding rates?

*£.* 500  
6

———— Answer 30*l.* at 6 per cent.  
*£.* 30|00

	$\frac{1}{10}$	$\frac{1}{10}$	500	
			25 at 5 per cent.	
Take	$\frac{1}{2}$		12 10 at $2\frac{1}{2}$	
	$\frac{1}{2} + \frac{1}{10}$		15 0 at 3	
	$\frac{1}{2} + \frac{1}{5}$		17 10 at $3\frac{1}{2}$	
Subtract	$\frac{1}{2}$		20 0 at 4	} Answer.
	$\frac{1}{2}$		22 10 at $4\frac{1}{2}$	
Add	$\frac{1}{10}$		27 10 at $5\frac{1}{2}$	
	$\frac{1}{2}$		30 0 at 6	
	$\frac{1}{2} + \frac{1}{10}$		32 10 at $6\frac{1}{2}$	
	$\frac{1}{2} + \frac{1}{5}$		35 0 at 7	

2 What is the interest of 87*l.* 14*s.* 5*d.* for one year, at 6 per cent per annum? *Answer* 5*l.* 5*s.* 3*d.*

3 What is the amount of 173*l.* 17*s.* 8*d.*  $\frac{1}{2}$  for a year, at 7 per cent. per annum? *Answer* 186*l.* 1*s.* 1*d.*  $\frac{3}{4}$

4 What is the amount of a bond for 176*l.* 13*s.* 9*d.* at the end of 9 years, at 5 per cent. per annum?

*Answer* 256*l.* 3*s.* 11*d.*  $\frac{1}{2}$

5 An uncle left by will to his niece 1256*l.* 15*s.* 6*d.* at the time of her marriage, there was 7 years interest due on the legacy, at 6 per cent. per annum; what sum must her executor pay? *Answer* 1784*l.* 12*s.* 4*d.*  $\frac{1}{2}$

## C A S E 2.

When the rate per cent. is  $\frac{1}{4}$ ,  $\frac{1}{2}$ , or  $\frac{3}{4}$  more than the pounds given;

## R U L E.

To the product made by the pounds, add  $\frac{1}{4}$ ,  $\frac{1}{2}$ , or  $\frac{3}{4}$  of the principal, and divide by 100 for the interest required.

## H

## E X A M P L E.

## EXAMPLES.

1 What is the interest of 246*l.* 18*s.* for 5 years, at  $4\frac{1}{2}$  per cent. per annum?

$\frac{1}{2}$	$\begin{array}{r} \text{£. } s. \\ 246 \text{ } 18 \\ \hline \phantom{246} 4 \\ \hline 987 \text{ } 12 \\ 61 \text{ } 14 \text{ } 6 \end{array}$	$\begin{array}{r} \text{£. } s. \text{ } d. \\ 10 \text{ } 9 \text{ } 10\frac{1}{2} \\ \hline \phantom{10 \text{ } 9} 5 \\ \hline 52 \text{ } 9 \text{ } 3\frac{1}{2} \text{ } \textit{Answer.} \end{array}$
---------------	--	--

$$\begin{array}{r} \text{£. } 10 \text{ } 49 \text{ } 6 \text{ } 6 \\ \hline \phantom{£. } 20 \end{array}$$

$$\begin{array}{r} s. \text{ } 9 \text{ } 86 \\ \hline \phantom{s. } 12 \end{array}$$

$$\begin{array}{r} d. \text{ } 10 \text{ } 38 \\ \hline \phantom{d. } 4 \end{array}$$

$$\text{gr. } 1 \text{ } 52$$

2 Calculate the interest of a bond for 427*l.* 18*s.* 9*d.* for 2 years, at  $5\frac{1}{2}$  per cent. per annum. *Facit* 49*l.* 4*s.* 3*d.*

3 What sum will 1096*l.* 15*s.* 6*d.* amount to in 4 years, at  $6\frac{1}{2}$  per cent. per annum? *Answer* 1381*l.* 18*s.* 8*d.*

## C A S E 3.

When the time given is months, weeks, or days, less or more than a year;

## R U L E.

As the months, weeks, or days in a year,  
Are to the interest of the given sum for a year;  
So are the months, weeks, or days in the time given,  
To the interest required,

Or, take aliquot parts of the yearly interest, for the given parts of a year.

## EXAMPLES.

1 What will 300*l.* amount to in 5 years and 10 months, at  $4\frac{1}{2}$  per cent. per annum?

	£.	mo.	£.	s.	mo.	£.	s.	d.
$\frac{1}{2}$	300	As 12	14	5	70	83	2	6 Interest.
	4					300	0	0 Principal.
	1200					383	2	6 Answer.
$\frac{1}{2}$	150							
	75							

£. 14|25  
20  
s. 5|00

Or, thus,

mo.	£.	s.	d.
6 $\frac{1}{2}$	14	5	Interest for 1 year.
4 $\frac{1}{2}$		5	Years.
	71	5	
	7	2	6
	4	15	0
	83	2	6 Interest.
	300	0	0 Principal.
	383	2	6 Amount.

2 What is the interest of 57*l.* 17*s.* 8*d.* for three months, at 6 per cent. per annum? *Answer* 17*s.* 4*d.*  $\frac{1}{2}$

3 How much is the interest of 150*l.* 19*s.* for 3 years and 4 months at 6 per cent. per annum? *Answer* 30*l.* 3*s.* 9*d.*

4 What is the interest of 126*l.* 12*s.* for 16 weeks, at 4  $\frac{1}{2}$  per cent. per annum? *Answer* 1*l.* 15*s.* 0*d.*  $\frac{1}{2}$

5 How much is the amount of 243*l.* 17*s.* for 146 days, at 5  $\frac{1}{2}$  per cent? *Answer* 249*l.* 9*s.* 2*d.*

6 What is the interest of 71*l.* 3*s.* 11*d.*  $\frac{1}{2}$  for 1 year, 5 months and 25 days, at 6 per cent. per annum? *Answer* 6*l.* 6*s.* 10*d.*  $\frac{1}{2}$

7 What the amount of a bond for 116*l.* 17*s.* 2*d.* for 6 years, 7 months, and 19 days, at 7 per cent. per annum? *Answer* 171*l.* 2*s.* 7*d.*

The interest of any sum, for any time, at 6 per cent. per annum, may also be found by this

## R U L E.

Multiply the principal by half the time in months, and divide by 100.

Note.



Note 1. If there be days, take for them such part or parts of the principal as half the days are of 30; deducting from the interest so found as many pence as there are threes in the pounds of those parts excepting the units.

2. If the days exceed 30, bring them into months of 30 days each; deducting as above for the threes in the total.

3. For 7 per cent. to the interest at 6, add on sixth.

8 What is the interest of 827*l.* 18*s.* 10*d.*  $\frac{1}{2}$  for one year, 11 months, and 20 days, at 6 per cent. per annum?

<i>M.</i> <i>d.</i>	<i>d.</i>	<i>£.</i> <i>s.</i> <i>d.</i>	
23 20	10 = $\frac{1}{3}$	827 18 10 $\frac{1}{2}$	
		11 $\frac{1}{2}$	
11 $\frac{1}{2}$ 10 half time.			
		9107 7 7 $\frac{1}{2}$	
		$\frac{1}{2}$ = 413 19 5 $\frac{1}{4}$	97 <i>l.</i> 19 5 <i>d.</i> $\frac{1}{2}$
		3) 2715 19 7 $\frac{1}{2}$ =	9
		£. 97 97 6 8 $\frac{1}{4}$	97 <i>l.</i> 18 <i>s.</i> 8 <i>d.</i> $\frac{1}{2}$
		20	<i>Answer.</i>
		s. 19 46	
		12	
		d. 5 60	
		4	
		gr. 2 41	

9 What sum will 674*l.* 13*s.* 8*d.*  $\frac{1}{2}$  amount, to, in 5 years, 11 months, and 28 days, at 6 per cent. per annum?

*Answer* 917*l.* 6*s.* 1*d.*

10 What is the interest of 517*l.* 15*s.* 4*d.* for 1 month, at 6 per cent. per annum?

*Answer* 2*l.* 11*s.* 9*d.*  $\frac{1}{4}$

11 What is the interest of 327*l.* 10*s.* at 6 per cent. per annum, for 210 days?

*Answer* 11*l.* 6*s.* 1*d.*

12 At 6 per cent. what will the interest be of 100*l.* from the 5th. of the 7th. month (July) to the 9th of the 1st. month (January?)

*Answer* 3*l.* 1*s.* 9*d.*  $\frac{1}{2}$

13 Tell the interest of 240*l.* for 1 year and 135 days, at 7 per cent. per annum?

*Answer* 23*l.* 0*s.* 3*d.*

14 What is the interest of 371*l.* for 1 year and 213 days, at 6 per cent. per annum?

*Answer* 35*l.* 5*s.* 0*d.*

15 What

15 What is the interest of a bond for 325*l.* 15*s.* 6*d.* for 1 year and 73 days, at 7 per cent. per annum?

*Answer* 27*l.* 7*s.* 3*d.* $\frac{1}{2}$

16 Required the interest of a bond for 148*l.* 12*s.* 6*d.* $\frac{1}{2}$  for 11 months, at 6 per cent. per annum?

*Answer* 8*l.* 3*s.* 3*d.* $\frac{3}{4}$

17 What sum will a bond of 333*l.* 13*s.* 3*d.* $\frac{1}{4}$  amount to in 17 months, at 6 per cent. per annum?

*Answer* 362*l.* 0*s.* 6*d.* $\frac{1}{2}$

18 A father left a legacy to his daughter of 651*l.* 11*s.* to be at interest until she attained the age of eighteen; at his decease she was 15 years and 219 days old; what sum must she call on her executor for, interest computed at 7 per cent. per annum?

*Answer* 761*l.* 0*s.* 2*d.* $\frac{1}{2}$

19 What interest is due on a legacy of 517*l.* 12*s.* 8*d.* $\frac{1}{2}$  for 5 years, 11 months and 25 days, at 6 per cent. per annum?

*Answer* 185*l.* 17*s.* 9*d.*

20 What is the interest of one farthing from the creation to this time, 5794 years, at 7 per cent. per annum?

*Answer* 8*s.* 5*d.* $\frac{1}{4}$

21 A owes B the following sums, with the interest on them at 6 per cent. per annum, *viz.* 60*l.* for 7 months; 150*l.* for 15 months; 75*l.* 10*s.* for 9 months; 145*l.* 15*s.* for 27 months, and 397*l.* 12*s.* for 45 $\frac{1}{2}$  months: what is the amount of the principal and interest?

*Answer* 955*l.* 14*s.* 6*d.* $\frac{1}{2}$

## CASE 4.

### INSURANCE, COMMISSION AND BROKAGE.

Insurance, commission and brokerage, are allowances made to insurers, factors, or brokers, at a stipulated rate per cent.

### RULE.

For the insurance, or commission, work as if to find the interest of the given sum, at the proposed rate, for 1 year; and for the brokerage, divide the sum by 100, and take such aliquot parts of the quotient, as the brokerage is of a pound.

*Simple Interest.*

## E X A M P L E S.

8. A factor has disbursed upon his employer's account the sum of 100*g*l. 18*s*. what must be demanded for his commission; at  $2\frac{1}{2}$  per cent?

<i>£.</i>	<i>s.</i>	<i>d.</i>	<i>£.</i>	<i>s.</i>	<i>d.</i>
1009	18		22	14	$5\frac{1}{2}$
		2			—
2019	19				
252	9	6			
2272	5	6			
	20				
	14	45			
		12			
	5	46			
		4			
	1	84			

2. What is the insurance of an East India ship and cargo, valued at 740*g*l. 17*s*. 6*d*. at  $15\frac{1}{2}$  per cent?

*Answer* 116*g*l. 11*s*. 7*d*.  $\frac{1}{2}$

3. Suppose  $1\frac{1}{2}$  per cent. be allowed for commission; what must be demanded on 704*g*l. 15*s*. 4*d*? *Answer* 12*l*. 6*s*. 8*d*.

4. What is the brokerage of 700*g*l. 14*s*. 6*d*. at 4*s*. per cent. *Answer* 1*l*. 8*s*. 0*d*.  $\frac{1}{2}$

5. What may a broker demand on 420*g*l. 12*s*. 6*d*. at 6*s*. 4*d*. per cent. *Answer* 1*l*. 6*s*. 7*d*.  $\frac{1}{2}$

6. The value of a ship and cargo is 8560*g*l. what is the insurance, at 35 per cent? *Answer* 299*g*l.

## C A S E. 5.

To find the principal, when the amount, time and rate per cent. are given.

## R U L E.

As the amount of 100*g*l. at the rate and time given,  
Is to 100*g*l.

As the amount given,  
Is principal required.

## EXAMPLES.

1. What principal at interest for, 9, years at 5, per cent. per annum, will amount to 725*l*?

$$\begin{array}{r} \text{£.} \\ 5 \\ 9 \\ \hline 45 \\ 100 \end{array}$$

As 145*l*. .. 100*l*. :: 725*l*. .. 500*l*. Answer.

2. What sum at interest for 9 years and 6 months, at 4½ per cent. per annum, will amount to 856*l*. 10*s*? Ans. 600*l*.

## CASE 6.

To find the rate per cent. when the amount, time, and principal are given;

## RULE.

As the principal,

Is to the interest of the whole time;

So is 100*l*.

To its interest for the same time;

Divide the interest last found by the time, and the quotient will be the rate per cent.

## EXAMPLES.

1. At what rate per cent. per annum, will 500*l*. amount to 725*l* in 9 years?

$$\begin{array}{r} \text{£.} \\ 725 \\ 500 \\ \hline \end{array}$$

As 500*l*. .. 225*l*. :: 100*l*. .. 45

Ans. er 5 per cent.

2. At what rate per cent. will 600*l*. amount 856*l*. 10*s*. in 9 years and 6 months?

Answer 4½ per cent.

## CASE 7.

To find the time, when the principal, amount and rate per cent are given;

## R U L E.

Divide the whole interest by that of the principal for one year; and the quotient will be the time required.

## E X A M P L E S.

1 In what time will 500*l.* amount to 725*l.* at 5 per cent. per annum?

$\begin{array}{r} \text{£.} \\ 500 \\ 5 \\ \hline \end{array}$	$\begin{array}{r} \text{£.} \\ 725 \\ 500 \\ \hline \end{array}$
--	--

$\text{£. } 25,00$        $25)225(9\text{y.}$  *Answer.*

2 In what time will 600*l.* amount to 856*l.* 10*s.* at  $4\frac{1}{2}$  per cent. per annum? *Answer 9y. 6m.*

3 A testator left his son, besides providing for his education, &c. 750*l.* to receive the amount thereof at 5 per cent. when he should arrive at the age of 21 years, which his guardian then found to be 1096*l.* 17*s.* 6*d.* how old was the boy at his father's decease? *Answer 11 years, 9 months.*

## A T A B L E.

## A T A B L E

For finding the Interest of any Sum of Money  
for any number of Months, Weeks, or Days,  
at any rate per cent

Year.	Calen. Month.	Week.	Day.
£.	£. s. d.	£. s. d.	£. s. d.
1	0 1 8	0 0 4 $\frac{1}{2}$	0 0 0 $\frac{3}{4}$
2	0 3 4	0 0 9	0 0 1 $\frac{1}{4}$
3	0 5 0	0 1 1 $\frac{3}{4}$	0 0 2
4	0 6 8	0 1 6 $\frac{1}{2}$	0 0 2 $\frac{3}{4}$
5	0 8 4	0 1 11	0 0 3 $\frac{1}{4}$
6	0 10 0	0 2 3 $\frac{1}{2}$	0 0 4
7	0 11 8	0 2 8 $\frac{1}{2}$	0 0 4 $\frac{1}{2}$
8	0 13 4	0 3 0 $\frac{1}{2}$	0 0 5 $\frac{1}{4}$
9	0 15 0	0 3 5 $\frac{1}{2}$	0 0 6
10	0 16 8	0 3 10 $\frac{1}{2}$	0 0 6 $\frac{1}{2}$
20	1 13 4	0 7 8 $\frac{1}{2}$	0 1 1 $\frac{1}{4}$
30	2 10 0	0 11 6 $\frac{1}{2}$	0 1 7 $\frac{1}{4}$
40	3 6 8	0 15 4 $\frac{1}{2}$	0 2 2 $\frac{1}{4}$
50	4 3 4	0 19 2 $\frac{1}{2}$	0 2 8 $\frac{1}{4}$
60	5 0 0	1 3 1	0 3 3 $\frac{1}{2}$
70	5 16 8	1 6 11	0 3 10
80	6 13 4	1 10 9 $\frac{1}{2}$	0 4 4 $\frac{1}{4}$
90	7 10 0	1 14 7 $\frac{1}{2}$	0 4 11 $\frac{1}{4}$
100	8 6 8	1 18 5 $\frac{1}{2}$	0 5 5 $\frac{1}{2}$
200	16 13 4	3 16 11	0 10 11 $\frac{1}{2}$
300	25 0 0	5 15 4 $\frac{1}{2}$	0 16 5 $\frac{1}{4}$
400	33 6 8	7 13 10	1 1 11
500	41 13 4	9 12 3 $\frac{1}{2}$	1 7 4 $\frac{3}{4}$
600	50 0 0	11 10 9	1 12 10 $\frac{1}{2}$
700	58 6 8	13 9 2 $\frac{3}{4}$	1 18 4 $\frac{1}{4}$
800	66 13 4	15 7 8 $\frac{1}{2}$	2 3 10
900	75 0 0	17 6 1 $\frac{1}{2}$	2 9 3 $\frac{1}{2}$
1000	83 6 8	19 4 7 $\frac{1}{2}$	2 14 9 $\frac{1}{2}$
2000	166 13 4	38 9 2 $\frac{1}{4}$	5 9 7
3000	250 0 0	57 13 10	8 4 4 $\frac{1}{2}$
4000	333 6 8	76 8 5 $\frac{1}{2}$	10 19 2 $\frac{1}{4}$
5000	416 13 4	96 3 0 $\frac{1}{2}$	13 13 11 $\frac{1}{4}$
6000	500 0 0	115 7 8 $\frac{1}{2}$	16 8 9 $\frac{1}{4}$
7000	583 6 8	134 12 3 $\frac{1}{2}$	19 3 6 $\frac{1}{2}$
8000	666 13 4	153 6 11	21 18 4 $\frac{1}{4}$
9000	750 0 0	173 1 6 $\frac{1}{2}$	24 13 1 $\frac{1}{2}$
10000	833 6 8	192 6 1 $\frac{1}{2}$	27 7 11 $\frac{1}{4}$
20000	1666 3 4	384 12 3 $\frac{1}{2}$	54 15 10 $\frac{1}{2}$
30000	2500 0 0	576 18 5 $\frac{1}{2}$	81 3 10
40000	3333 6 8	769 4 7 $\frac{1}{4}$	109 11 9 $\frac{1}{4}$
50000	4166 13 4	961 10 9	136 19 8 $\frac{1}{4}$



To calculate interest by the preceding table;

## R U L E.

Multiply the sum by the rate per cent. and that product by the months, weeks, or days given, then cut off the two last figures to the right hand, and enter the table with what remains to the left; against which numbers, collected, is the interest for the given sum.

Note. For every 10 cut off in months, add 2*d.* for every 20 in weeks, add 1*d.* and for every 40 in days, 1*qr.*

## E X A M P L E S.

- 1 What is the interest of 2466*l.* 16*s.* 6*d.* for 10 months, at 4 per cent. per annum?

<i>£.</i>	<i>s.</i>	<i>d.</i>	<i>£.</i>	<i>s.</i>	<i>d.</i>
2466	16	6	900 =	75	0 0
		4	80 =	6	13 4
			6 =		10 0
9867	6	0	Add	1	2 $\frac{1}{2}$
	10				
98673	0	0	<i>£.</i> 82	4	6 $\frac{1}{2}$ Answer.

- 2 What is the interest of 2467*l.* 10*s.* for 12 weeks, at 5 per cent. per annum?

<i>£.</i>	<i>s.</i>	<i>d.</i>
		1000 = 19 4 7 $\frac{1}{2}$
		400 = 7 13 10
2467	10	$\times 5 \times 12 = 1480$
	50	80 = 1 10 9 $\frac{1}{4}$
		Add 2 $\frac{1}{2}$
		Answer 28 <i>l.</i> 9 <i>s.</i> 5 <i>d.</i>

- 3 What is the interest of 2467*l.* 10*s.* for 50 days, at 6 per cent. per annum?

<i>£.</i>	<i>s.</i>	<i>d.</i>
		7000 = 19 3 6 $\frac{1}{2}$
		400 = 1 1 11
2467	10	$\times 6 \times 50 = 7401$
	50	2 = 1 $\frac{1}{2}$
		Add $\frac{1}{4}$
		Answer 20 <i>l.</i> 3 <i>s.</i> 7 <i>d.</i> $\frac{1}{4}$

To find what any estate from 1*l.* to 50000*l.* per annum be for a month, or a day;

## R U L E.

## R U L E.

Collect the sums from the table opposite the given numbers for the answer.

## E X A M P L E.

At 365*l.* per annum, what is that per day; also, per month?

	<i>s.</i>	<i>d.</i>	<i>£.</i>	<i>s.</i>	<i>d.</i>
300 =	16	5 $\frac{1}{2}$	25	0	0
60 =	3	3 $\frac{1}{2}$	5	0	0
5 =		3 $\frac{1}{2}$		8	4

*£.* 1 0 0 per day. *£.* 30 8 4 per month.

To find the amount of any income, salary, or servant's wages, for any number of months, weeks, or days;

## R U L E.

Multiply the yearly income, or salary, by the number of months, weeks, or days, and collect as before from the table.

## E X A M P L E S.

What will 270*l.* per annum come to for 11 months, for 3 weeks, and for 6 days, separately and collectively?

$$270 \times 11 = 2970 \left\{ \begin{array}{l} \text{£. } s. \text{ d.} \\ 166 \text{ } 13 \text{ } 4 \\ 75 \text{ } 0 \text{ } 0 \\ 5 \text{ } 16 \text{ } 8 \end{array} \right.$$

For 11 months 247*l.* 10*s.* 0*d.*

Collectively.

$$270 \times 3 = 810 \left\{ \begin{array}{l} \text{£. } s. \text{ d.} \\ 15 \text{ } 7 \text{ } 8\frac{1}{2} \\ 3 \text{ } 10 \end{array} \right.$$

$$\begin{array}{r} \text{£. } s. \text{ d.} \\ 247 \text{ } 10 \text{ } 0 \\ 15 \text{ } 11 \text{ } 6\frac{1}{2} \\ 4 \text{ } 8 \text{ } 9 \\ \hline 267 \text{ } 10 \text{ } 3\frac{1}{2} \end{array}$$

For 3 weeks 15 11 6 $\frac{1}{2}$

$$270 \times 6 = 1620 \left\{ \begin{array}{l} \text{£. } s. \text{ d.} \\ 2 \text{ } 14 \text{ } 9\frac{1}{2} \\ 1 \text{ } 12 \text{ } 10\frac{1}{2} \\ 1 \text{ } 1 \end{array} \right.$$

For 6 days 4 8 9

## A T A B L E

Of Days for any given Time less than a Year.

Days	1 <sup>st</sup> Mon.	2 <sup>d</sup> Mon.	3 <sup>d</sup> Mon.	4 <sup>th</sup> Mon.	5 <sup>th</sup> Mon.	6 <sup>th</sup> Mon.	7 <sup>th</sup> Mon.	8 <sup>th</sup> Mon.	9 <sup>th</sup> Mon.	10 <sup>th</sup> Mon.	11 <sup>th</sup> Mon.	12 <sup>th</sup> Mon.
1	1	32	60	61	121	152	182	213	244	274	305	335
2	2	33	61	92	122	153	183	214	245	275	306	336
3	3	34	62	93	123	154	184	215	246	276	307	337
4	4	35	63	94	124	155	185	216	247	277	308	338
5	5	36	64	95	125	156	186	217	248	278	309	339
6	6	37	65	96	126	157	187	218	249	279	310	340
7	7	38	66	97	127	158	188	219	250	280	311	341
8	8	39	67	98	128	159	189	220	251	281	312	342
9	9	40	68	99	129	160	190	221	252	282	313	343
10	10	41	69	100	130	161	191	222	253	283	314	344
11	11	42	70	101	131	162	192	223	254	284	315	345
12	12	43	71	102	132	163	193	224	255	285	316	346
13	13	44	72	103	133	164	194	225	256	286	317	347
14	14	45	73	104	134	165	195	226	257	287	318	348
15	15	46	74	105	135	166	196	227	258	288	319	349
16	16	47	75	106	136	167	197	228	259	289	320	350
17	17	48	76	107	137	168	198	229	260	290	321	351
18	18	49	77	108	138	169	199	230	261	291	322	352
19	19	50	78	109	139	170	200	231	262	292	323	353
20	20	51	79	110	140	171	201	232	263	293	324	354
21	21	52	80	111	141	172	202	233	264	294	325	355
22	22	53	81	112	142	173	203	234	265	295	326	356
23	23	54	82	113	143	174	204	235	266	296	327	357
24	24	55	83	114	144	175	205	236	267	297	328	358
25	25	56	84	115	145	176	206	237	268	298	329	359
26	26	57	85	116	146	177	207	238	269	299	330	360
27	27	58	86	117	147	178	208	239	270	300	331	361
28	28	59	87	118	148	179	209	240	271	301	332	362
29	29	60	88	119	149	180	210	241	272	302	333	363
30	30		89	120	150	181	211	242	273	303	334	364
31	31		90		151		212	243		304		365

## THE USE OF THE TABLE.

*First*, To know the number of days, from the beginning of the year, to any given day of any month :

This is obtained by inspection only.

*Secondly*, To find the number of days from any day in any month, to the end of the year :

Suppose from 10th 9mo.

From - - - - - 365

Take the days answering to 10th 9mo. 253

Remains - - - - - Days 112

*Thirdly*, To find the number of days between different dates :

Suppose the 9th of the 5th month and the 5th of the 11th month.

From the number answering to 5th 11mo. 309

Take that of the 9th 5mo. - 129

Remains - - - - - Days 180

*Fourthly*, To find the number of days from a given date, to some other in the year following :

Suppose, from 12th 10mo. to 10th 6mo. ensuing.

From - - - - - 365

Take the number answering to 12th 10mo. 285

80

To which add the 10th 6mo. - 161

Days required - - - - - 241

Note. If the intercalary day of a leap year intervene, 1 day must be added to those found as before.

## COMPOUND INTEREST.

Compound Interest is that which arises from a principal increased by its interest as the interest becomes due.



## R U L E.

Find the first year's amount by simple interest, which will be the principal for the second year; and the amount of this will be the principal for the third year, &c.

From the last amount, take the given principal, and the remainder will be the compound interest.

## E X A M P L E S.

1 What is the compound interest of 450*l.* for 3 years, at 5 per cent. per annum?

	<i>£.</i>	<i>s.</i>	<i>d.</i>
Principal	450	0	0
Interest = $\frac{1}{20}$ =	22	10	0
Amount 1st year	472	10	0
Interest = $\frac{1}{20}$ =	23	12	6
Amount 2d year	496	2	6
Interest = $\frac{1}{20}$ =	24	16	1 $\frac{1}{2}$
Amount 3d year	520	18	7 $\frac{1}{2}$
Principal	450		

*Answer £. 70 18 7 $\frac{1}{2}$*

2 What will 400*l.* amount to in 4 years, at 6 per cent. per annum?

*Answer 504*l.* 19*s.* 9d. $\frac{1}{4}$*

3 How much is the compound interest of 480*l.* for 6 years, at 5 per cent. per annum?

*Answer 163*l.* 4*s.* 10d. $\frac{1}{2}$*

4 What will 500*l.* amount to in 4 years, at 4 $\frac{1}{4}$  per cent. per annum?

*Answer 590*l.* 11*s.* 5d. $\frac{1}{2}$*

5 What is the compound interest of 400*l.* 10*s.* at 3 $\frac{1}{2}$  per cent. per annum for three years?

*Answer 43*l.* 10*s.* 9d. $\frac{1}{4}$*

## R E B A T E O R D I S C O U N T.

**R**EBATE or Discount, is an abatement for the payment of money before due, by accepting so much as would amount to the whole debt at the time payable, at given rate.

R U L E

R U L E.

As the amount of 100*l.* at the rate and time given,  
Is to 100*l.*

So is the whole debt,

To the present worth: (*See case 5th. Simple Interest.*)

Subtract the present worth from the whole debt, and the remainder will be the rebate.

P R O O F.

Find the amount of the present worth for the time and rate proposed, which must equal the given sum.

Note. Rebate, or Discount, is not the interest of the sum due (as some mistake it) but of the present worth. See example 7.

E X A M P L E S.

1 What is the rebate of 795*l.* 11*s.* 2*d.* for 11 months, at 6 per cent. per annum?

$$\begin{array}{r} m. \quad \text{£.} \quad m. \quad \text{£.} \quad s. \\ \text{As } 12 \quad 6 :: 11 \quad 5 \quad 10 \\ \hline 100 \quad 0 \end{array}$$

Amount 105 10

$$\begin{array}{r} \text{£.} \quad s. \quad \text{£.} \quad \text{£.} \quad s. \quad d. \quad \text{£.} \quad s. \quad d. \\ \text{As } 105 \quad 10 \quad 100 :: 795 \quad 11 \quad 2 \quad 754 \quad 1 \quad 8 \\ \hline \text{£.} \quad s. \quad d. \\ 795 \quad 11 \quad 2 \\ 754 \quad 1 \quad 8 \quad \text{present worth.} \end{array}$$

41 9 6 Rebate, Answer.

2 What is the present worth of 161*l.* 10*s.* for 19 months, discount at 5 per cent?

Answer 149*l.* 13*s.* 0*d.*  $\frac{1}{2}$

3 Sold goods for 795*l.* 11*s.* 2*d.* to be paid 4 months hence; what is the present worth, at 3  $\frac{1}{2}$  per cent?

Answer 786*l.* 7*s.* 8*d.*

4 What is the rebate of 112*l.* 12*s.* for 20 months, at 7 per cent?

Answer 11*l.* 15*s.* 3*d.*  $\frac{1}{2}$

5 Sold goods for 312*l.* one half to be paid at 3 months, and the other half at 6 months; what must be discounted for present payment, at 5 per cent?

Answer 51*l.* 14*s.* 7*d.*  $\frac{1}{2}$

6 What



6 What is the present worth of 100*l.* one half payable at 4 months, and the other at 8 months; discount at 5 per cent?

*Answer* 97*l.* 11*s.* 4*d.*

7 What difference is there between the interest of 500*l.* at 5 per cent. per annum for 12 years, and the discount of the same sum, at the same rate, and for the same time?

*Answer* 112*l.* 10*s.*

## EQUATION.

**E**QUATION is the method of reducing several stated times, at which money is payable, to one mean, or equated time.

### R U L E.

Multiply each payment by its time, and divide the total of the products by the sum payable at the time required; the quotient will be the equated time.

### P R O O F.

The interest of the sum payable at the equated time, at any given rate, will equal the interest of the several payments for their respective times.

### E X A M P L E S.

1 A owes B 100*l.* of which 50*l.* are to paid at 2 months, and 50*l.* at four months, but they agree to reduce them to one payment; when must the whole be paid?

$$50 \times 2 = 100$$

$$50 \times 4 = 200$$

$$\begin{array}{r} 100 \quad 300 \\ \hline \end{array}$$

*Answer* 3 *M.*

2 A merchant has owing to him 300*l.* to be paid as follows, viz. 50*l.* at 2 months, 100*l.* at 5 months, and the rest at 8 months, but it is agreed to make one payment of the whole; when will that time be?

*Answer* at 6 months.

3 F owes H 1000*l.* of which 200*l.* are to be paid present, 400*l.* at 5 months, and the rest at 10 months, but they agree to make one payment of the whole, and wish to know time?

*Answer* 6 months.

4 C owes D a sum of money, which is to be discharged, viz.  $\frac{1}{4}$  at 2 months,  $\frac{1}{4}$  at 4 months,  $\frac{1}{4}$  at 6 months, and  $\frac{1}{4}$  at 8 months; but they agreeing to make one payment of the whole, the equated time is required?

*Answer 5 months.*

5 E is indebted to F 240*l.* which by agreement is to be paid 5 months hence, but E is willing to pay him 40*l.* present, provided he will give him longer time to pay the remainder, which is agreed on; the time of payment is therefore required!

*Answer 6 months.*

6 P owes Q 420*l.* which will be due 6 months hence, but P is willing to pay him 60*l.* present, provided he can have the remainder forborn a longer time, to which Q agrees; the time of payment is required?

*Answer 7 months.*

## BARTER.

**B**ARTER is the exchanging of one commodity for another, by duly proportioning their quantities and values.

### RULE.

Work by the rule of Three direct, or inverse, or by Practice, as the tenor of the question may require.

### EXAMPLES.

1 How much sugar at 9*d.* per *lb.* should be bartered for  $6\frac{1}{2}$  *C.* wt. of tobacco, at 14*d.* per *lb.*?

$$\begin{array}{ccccccc} & \text{lb.} & \text{d.} & \text{C. gr.} & \text{d.} & & \\ \text{As } 1 & \cdot & 14 & :: & 6 & 2 & :: 10192 \\ & \text{d.} & \text{lb.} & \text{d.} & \text{C. gr.} & \text{lb.} & \end{array}$$

Then, As 9  $\cdot$  1 :: 10192  $\cdot$  10 0 12 $\frac{4}{5}$  *Answer.*

Or thus,

$$\begin{array}{ccccccc} & \text{d. per lb.} & \text{C. gr.} & & \text{d. per lb.} & \text{C. gr.} & \text{lb.} \\ \text{Inverse. If } 14 & \cdot & 6 & 2 & :: & 9 & \cdot & 10 & 0 & 12\frac{4}{5} \end{array}$$

2 What quantity of tea, at 10*s.* per *lb.* must be given for 1 *C.* wt. of chocolate, at 4*s.* per *lb.*?

*Answer 44lb. 12oz.  $\frac{1}{2}$*

3 how much rice, at 28*s.* per *C.* wt. must be bartered for  $3\frac{1}{2}$  *C.* of raisins, at 5*d.* per *lb.*

*Answer 5C. 3qr. 9lb.  $\frac{1}{2}$*

4 A has linen cloth worth 20*d.* an ell ready money, but in barter he will have 2*s.* B has broad cloth worth 14*s.* 6*d.* per *y**d.* ready money; at what price ought the broad cloth to be rated in barter? *Answer* 17*s.* 4*d.*  $\frac{3}{4}$  +

5 Suppose C has tea at 8*s.* 6*d.* per *lb.* ready money, but in barter he will have 10*s.* per *lb.* D has tobacco worth 18*d.* per *lb.* ready money; how must he rate his tobacco per *lb.* to equal the tea in value? *Answer* 1*s.* 9*d.* +

6 A has nutmegs worth 7*s.* 6*d.* per *lb.* ready money, but in barter will have 8*s.* per *lb.* D has tobacco worth 9*d.* *lb.* ready money; how must D rate his tobacco, that his profits may be equivalent with A's? *Answer* 9*d.*  $\frac{1}{2}$

7 A had 41 *C.**wt.* of iron, at 30*s.* per *C.**wt.* for which B. gave him 20*l.* in money, and the rest in pork at 5*d.* per *lb.* how much pork must be given besides the 20*l.* *Answer* 1992*lb.*

8 A has 320 dozen of candles, at 9*s.* per *doz.* for which B agrees to pay him 60*l.* in cash, and the rest in cotton at 16*d.* per *lb.* how much cotton must B give A? *Answer* 1260*lb.*

9 K has 75 sheep at 14*s.* 6*d.* each, for which L is to give him 17*l.* 12*s.* and the rest in Indian corn, at 3*s.* 6*d.* per bushel; how much corn must L give K? *Answer* 210*bu.* 4*q**ts.*

10 A and B bartered: A had 5 *C.* of sugar, at 6*d.* per *lb.* which he gave to B for a quantity of cinnamon, at 10*s.* 8*d.* per *lb.* how much cinnamon did B give A? *Answer* 26*lb.* 4*oz.*

11 B delivered 3 hogsheads of brandy at 6*s.* 8*d.* per gallon, to C, for 126 yards of cloth; what was the cloth per yard; *Answer* 10*s.*

12 C has candles at 12*s.* per dozen ready money, but in barter he will have 13*s.* per dozen, D has cotton at 18*d.* per *lb.* ready money; what price must the cotton be at in barter, and how much must be bartered for 100 dozen of candles? *Answer* the cotton at 19*d.*  $\frac{1}{2}$  per *lb.* and 800*lb.* must be given for 100 dozen of candles.

13 A has linen at 10*d.* the ell ready money, but in barter B has 3610*lb.* of sugar at 7*d.*  $\frac{1}{2}$  per *lb.* ready money, and will have of A 35*l.* in cash, and the rest in linen: at what is the sugar in barter, and how much linen must A give *Answer* the sugar 9*d.* and 1867  $\frac{1}{2}$  ells.

14 Two merchants barter; A receives 20*C.wt.* of cheese, at 2*1s.* 6*d.* per *C.wt.* B, 8 pieces of linen, at 3*l.* 14*s.* per piece, which of them must receive money, and how much?

*Answer* A 8*l.* 2*s.*

15 If 24 yards of cloth be given for 5*C.* 1*qr.* of tobacco, at 1*l.* 18*s.* per *C.wt.* what is the cloth rated at per yard?

*Answer* 8*s.* 3*d.*  $\frac{1}{2}$

16 A barter 40 yards of cloth at 7*s.* 4*d.* per yard, with B for 28  $\frac{1}{2}$  *lb.* of tea, at 1*1s.* 6*d.* per *lb.* which must pay balance, and how much?

*Answer* A 1*l.* 14*s.* 5*d.*

17 A has 7  $\frac{1}{2}$  *C.wt.* of sugar, at 8*d.* per *lb.* for which B gave him 12  $\frac{1}{2}$  *C.wt.* of cheese; what was the cheese rated at per *lb.*?

*Answer* 4*d.*  $\frac{3}{4}$

18 What quantity of sugar at 8*d.* per *lb.* must be given in barter for 20*C.wt.* of tobacco, at 3*l.* per *C.wt.*?

*Answer* 16*C.wt.* 8*lb.*

19 P has coffee, which he barter with Q at 10*d.* per *lb.* more than it cost him, against tea, which stands Q in 10*s.* the *lb.* but puts it at 12*s.* 6*d.* query the prime cost of the coffee?

*Answer* 3*s.* 4*d.*

20 A and B barter; A has 12  $\frac{1}{2}$  *C.wt.* of hops at 2*l.* 16*s.* per *C.wt.* but in barter insists on 3*l.* B has wine worth 5*s.* a gallon, which he raises in proportion to A's demand: on the balance, A received but a *hhd.* of wine; what had he in ready money?

*Answer* 20*l.* 12*s.* 6*d.*

## LOSS AND GAIN.

**L**OSS and Gain is a method of computing the profit or loss on the purchase or sale of goods, &c.

### R U L E.

Work by the Rule of Three, or by Practice, as the nature of the question may require.

### E X A M P L E S.

1 Bought 18*C.* of iron, at 28*s.* per *C.* and retailed it at 3*d.*  $\frac{1}{2}$  per *lb.* what is gained in the whole?

	<i>C.</i>	<i>s.</i>	<i>C.</i>	<i>l.</i>	<i>s.</i>
If	1	..	28	::	18
				..	25
					4
	18 <i>C.</i>	=	2016 <i>lb.</i>	at	3 <i>d.</i> $\frac{1}{2}$
				=	29 <i>l.</i> 8 <i>s.</i>
					fold for
					29 <i>l.</i> 8 <i>s.</i>
					25 <i>l.</i> 4 <i>s.</i>
					= 4 <i>l.</i> 4 <i>s.</i>
					<i>Answer.</i>

2 Bought knives for 20*d.* each, and sold them at 17*d.* each; how much is lost by the sale of 120 dozen?

*Answer* 18*l.*

3 Hats bought at 4*s.* a piece, and sold at 4*s.* 9*d.* what is the gain per cent.

*Answer* 18*l.* 15*s.*

4 Bought 7 tuns of wine, at 17*l.* per *bhd.* and sold it at 1*s.* per pint, what is the whole gain, and the gain per cent?

*Answer* whole gain 229*l.* 12*s.* per cent 48*l.* 4*s.* 8*d.*  $\frac{1}{2}$

5 A draper bought 100 yards of cloth for 56*l.* how much he sell it per yard to gain 19*l.* in the whole?

*Answer* 15*s.* per yard.

6 Bought 60 reams of paper, at 15*s.* per ream; what is lost in the whole quantity, at 4 per cent?

*Answer* 1*l.* 16*s.*

7 Sold 500 penknives, at 15*d.* a piece, and 9 per cent. loss; what is lost in the whole number?

*Answer* 3*l.* 1*s.* 9*d.*  $\frac{1}{2}$

8 Paid 69*l.* for one ton of steel; what is the profit or loss on the sale of 14 tons retailed at 6*d.* per *lb.*?

*Answer* 182*l.* loss.

9 If a yard of cloth be bought for 13*s.* 4*d.* and sold for 16*s.* what is the gain per cent?

*Answer* 20*l.*

10 If 1*c.* of tobacco be bought for 4*l.* 13*s.* 4*d.* and sold at 11*d.* per *lb.* what is the gain or loss per cent?

*Answer* 10*l.* gain.

11 A draper bought 100 yards of cloth for 56*l.* how much he sell it per yard, to gain 15*l.* per cent?

*Answer* 12*s.* 10*d.*  $\frac{1}{2}$

12 Sold 12 yards of cloth for 5*l.* 14*s.* by which was gained 8*l.* per cent. what was the prime cost of a yard?

*Answer* 8*s.* 9*d.*  $\frac{1}{2}$  +

13 Having bought a parcel of goods for 18*l.* and sold the same immediately for 25*l.* with 4 months credit; what is gained per cent. per annum?

*Answer* 116*l.* 13*s.* 4*d.*

14 Bought 300*lb.* of coffee at 4*s.* 2*d.* per *lb.* ready money, and sold it at 5*s.* per *lb.* payable in 8 months; how much was gained on the whole allowing discount at 6 per cent. and how much per cent. per annum?

*Answer*  $\left\{ \begin{array}{l} 9*l.* 12*s.* 3*d.*  $\frac{1}{2}$  whole gain. \\ 30 \end{array} \right.$  per cent.

15 If, when cloth is sold at 7*s.* per yard, there is gained 20 per cent. what will be the gain per cent. when it is sold 8*s.* 6*d.* per yard?

*Answer* 33*l.* 11*s.* 5*d.*  $\frac{1}{2}$



16 Bought a chest of tea, weighing 490lb. for 122l. 10s. and sold it for 138l. 16s. 8d. what was the profit on each lb?

*Answer* 8d.

17 Bought 12 pieces of white cloth, for 6l. 10s. per piece, paid 20s. 10d. a piece for dying; for how much must I sell them each, to gain 20 per cent?

*Answer* 9l. 1s.

18 If 28 pieces of stuff be purchased at 4l. per piece, and 10 of them sold at 6l. and 8 at 5l. per piece; at what rate must the rest be disposed of, to gain 10 per cent. by the whole

*Answer* 2l. 6s. 4d.  $\frac{2}{3}$

19 Sold a yard of cloth for 11s. 6d. by which was gained at the rate of 15 per cent. but, if it had been sold for 12s. what would have been the gain per cent?

*Answer* 20l.

20 If, when cloth is sold at 7s a yard, the gain is 10l. per cent, what is the gain or loss per cent. when it is sold at 6s. a yard?

*Answer* 5l. 14s. 3d.  $\frac{3}{4}$  loss

21 At 1d.  $\frac{1}{2}$  per shilling profit, how much per cent?

*Answer* 12l. 10s.

22 At 3s. 6d. in the pound profit, how much per cent;

*Answer* 17l. 10s.

23 If by selling 1lb. of pepper for 10d.  $\frac{1}{2}$  there is 2d. lost, how much is the loss per cent?

*Answer* 16l.

24 A merchant receives from Lisbon 180 casks of raisins, which stand him here in 16s each; and by selling them at 28s. per Cwt. he gains 25 per cent. required the weight of each cask one with another?

*Answer* 80lb.

## F E L L O W S H I P.

**F**ELLOWSHIP is the rule for adjusting the several quotas of the loss or gain on any joint adventure, or of a bankrupt's effects, &c.

### C A S E 1.

When the several stocks in company are considered without regard to time;

### R U L E.

As the whole sum, or stock,  
Is to the whole gain, or loss;  
So is each partner's share in stock, &c.  
To his quota of the gain, or loss.

P R O O F.



## P R O O F.

The sum of the several shares, must equal the whole gain, or loss.

## E X A M P L E S.

1 Three merchants traded: A put in 140*l*. B 300*l*. and C 160*l*. their gain was 120*l*. What is each man's share thereof?

$$\begin{array}{l} \text{A } 140 \\ \text{B } 300 \text{ As } 600 \dots 120 :: \\ \text{C } 160 \end{array} \quad \left\{ \begin{array}{l} 140 \dots 28 \text{ A's share.} \\ 300 \dots 60 \text{ B's share.} \\ 160 \dots 32 \text{ C's share.} \end{array} \right\} \text{Answer.}$$

*£*. 600

*£*. 120 Proof.

2 Three merchants trading to Virginia, lost goods to the value of 800*l*. now suppose A's stock was 1200*l*. B's 4800*l*. and C's 2000*l*. what sum must each man sustain of the loss?

*Answer* A 120*l*. B 480*l*. C 200*l*.

3 A, B and C, freighted a ship with 108 tuns of wine, of which A had 48 tuns, B 36, and C 24, but by reason of stormy weather were obliged to cast 45 tuns overboard; how much must each man sustain of the loss?

*Answer* A 20, B 15, and C 10 tons.

4 Suppose a merchant is indebted to S 70*l*. T 400*l*. V 140*l*. 12*s* 6*d*. but upon his death his estate is found to be worth only 409*l*. 14*s*. how must it be divided among his creditors?

*Answer* S must have 46*l*. 19*s*. 3*d*.  $\frac{1}{2}$  T 268*l*. 7*s*. 7*d*.  $\frac{1}{2}$

V 94*l*. 7*s*. 0*d*.  $\frac{1}{2}$

5 If the money and effects of a bankrupt amount to 1400*l*. 14*s*. 6*d*. and he is indebted to A 742*l*. 12*s*. to B 641*l*. 19*s*. 8*d*. and to C 987*l*. 19*s*. 9*d*. how must it be divided among them?

*Answer* A must have 438*l*. 8*s*. 4*d*.  $\frac{1}{4}$ , B 379*l*. 3*d*.  $\frac{1}{4}$ ,

C 583*l* 5*s*. 9*d*.  $\frac{1}{2}$

6 Three graziers, A, B, and C, rent an estate, containing 292 acres, 3 roods, 17 perches, at 200*l*. per annum; of which A pays 60*l*. B 6*l*. and C 75*l*. they have agreed that the estate shall be divided in proportion to the rents; what is each man's dividend?

A. R. P.

$$\text{Answer } \left\{ \begin{array}{l} \text{A's share } 87 \ 3 \ 17 \\ \text{B's } \quad \quad 95 \ 0 \ 28 \\ \text{C's } \quad \quad 109 \ 3 \ 11 \end{array} \right.$$

7 P, Q, and R, rent an estate, containing 360 acres, at 240*l.* per annum; of which P holds 90, Q 120, and R 150 acres; what must each man pay, in proportion to the land he holds?

Answer  $\left\{ \begin{array}{l} P \ 60\text{ }l. \\ Q \ 80\text{ }l. \\ R \ 100\text{ }l. \end{array} \right.$

## C A S E 2.

When the respective stocks in company are considered with time;

## R U L E.

Multiply each man's stock by its time; then,  
As the sum of the products,  
Is to the whole gain or loss;  
So is each particular product,  
To its share of the gain or loss.

## E X A M P L E S.

1 Three merchants traded together: A put in 120*l.* for 9 months, B 100*l.* for 16 months, and C 100*l.* for 14 months, and they gained 100*l.* what is each man's quota?

$\begin{array}{r} \text{£.} \quad m. \\ A \quad 120 \times 9 = 1080 \\ B \quad 100 \times 16 = 1600 \\ C \quad 100 \times 14 = 1400 \end{array}$

Sum 4080

	Sum.	£.	s.	d.	q.		
Sum.	£.	1080	26	9	4	3	$\frac{1120}{4080}$ A's
As 4080	100	1600	39	4	3	3	$\frac{240}{4080}$ B's
		1400	34	6	3	1	$\frac{720}{4080}$ C's

Answer  $\left\{ \begin{array}{l} A's \\ B's \\ C's \end{array} \right.$

100 0 0 0 Proof.

2 Three merchants in a joint adventure put in as follows: A 400*l.* for 9 months, B 680*l.* for 5 months, and C 120*l.* for 12 months; but by misfortune lost goods to the value of 500*l.* what must each sustain of the loss? Answer A must lose 213*l.* 5*s.* 4*d.*  $\frac{1}{4}$ , B 201*l.* 8*s.* 5*d.* and C 85*l.* 6*s.* 1*d.*  $\frac{3}{4}$

3 A, B, and C hold a pasture in common, for which they pay 20*l.* per annum; in this pasture A had 40 oxen for 76 days, B 36 for 50 days, and C 50 for 90 days; what part of the 20*l.* must each of them pay? Answer A must pay 6*l.* 10*s.* 2*d.*  $\frac{1}{4}$ , B 3*l.* 17*s.* 1*d.* C 9*l.* 12*s.* 8*d.*  $\frac{1}{2}$

4 A put in stock 180*l*. B advanced 4 months after ; required the sum he put in, so as at the years end to claim equal profits with A ? *Answer* 270*l*.

5 A, B, and C join stocks for 12 months ; A puts in 100*l*. and the first of the fifth month 150*l*. more ; and on the first of the ninth month takes out 30*l* B puts in 250*l*. on the first of the sixth month 60*l* more ; and on the first of the eleventh month 100*l*. more ; C puts in 300*l*. on the first of the fourth month takes out 200*l* and on the first of the eighth month takes out 50*l*. more ; the whole gain is 133*l*. what is each partner's proper share of it ?

*Answer* A must have 40*l*. 14*s*. 0*d*.  $\frac{1}{2}$ . B 64*l*. 12*s*. 6*d*.  
C 27*l*. 13*s*. 5*d*.

6 A, B, and C made a stock for 12 months ; A put in at first 364*l*. and 4 months after he put in 40*l*. more ; B put in at first 408*l*. and at the end of 7 months he took out 86*l*. C put in at first 148*l* and three months after he put in 86*l* and 5 months after that he put in 100*l*. more ; and at the end of 12 months, their gain is found to be 1436*l*. what is each man's share thereof ? *Answer* A 556*l*. 3*s*. 6*d*.  $\frac{1}{2}$   
B 529*l*. 16*s*. 9*d*.  $\frac{1}{2}$ . C 349*l*. 19*s*. 8*d*.

7 A, B, and C join in company : A's stock is 50*l*. for 12 months, B's 160 yards of cloth 8 months, and C's 240 bushels of wheat 7 months ; their gain is such, that A and B's share is 456*l*. B and C's 431*l*. C and A's 375*l*.—Required the whole gain ; each one's respectively ; the price of B's cloth per yard, and what C's wheat was per bushel ?

*Answer* whole gain 631*l*. A's share 200*l*. B's 256*l*. and C's 175*l*. B's cloth 12*s*. per yard, and C's wheat 6*s*. 3*d*. per bushel.

## E X C H A N G E.

**E**XCHANGE is the rule, by which the money, &c. of one state or country, is reduced to that of another.

Par is equality in value, but the course of exchange is frequently above or below par.

Agio is a term used, to signify the difference, in some countries, between bank and current money.

### C A S E 1.

*Exchange between the United States.*

R U L E.



## R U L E.

As dollars rate from state to state,

Make other coins proportionate.

Or,—Work by the theorem in the following table, opposite to the state of which the given sum is, and under at to which it is to be reduced.

## P R O O F.

Vary the operation, or prove one of these methods by the other.

A T A B L E					
<i>Exhibing the Value of a Dollar in each of the United States; and practical Theorems for exchanging the Currency of either, into that of any other.</i>					
To exchange from	to	{			
		N. Engl. States & Virginia. Pennsylvani. Jer. Del. Maryland. New York and N. Carolina. S. Carolina and Georgia.			
* New England States and Virginia	Dollar 6/0	Add one 4th	Add one 3d	Subtract $\frac{1}{2}$ twice	
Pennsylvania, N. Jersey, Delaware & Maryland	Subtract one 5th	Dollar 7/6	Add one 15th	$\times 3 \frac{1}{2}$ & $\div 5$	
New York and North Carolina	Subtract one 4th	Subtract one 16th	Dollar 8/0	To $\frac{1}{2}$ add $\frac{1}{8}$ of the $\frac{1}{2}$	
South Carolina and Georgia	Add two 7ths	Add $\frac{1}{7}$ that $\frac{1}{2}$ & $\frac{1}{2}$ that $\frac{1}{7}$	$\times 2$ & Subt. Product	Dollar 4/8	

\* The New England States are, New Hampshire, Massachusetts, Rhode-Island, and Connecticut.

Note. The value of a dollar in any state is found, either opposite to that state, or under it, in the table.

## EXAMPLES.

1 What is the value of 420*l.* South Carolina currency in New-York?

*s. d. s. £. £.*  
As 4 8 .. 8 :: 420 .. 720 *Answer*

*£.*  
Or, 420  
2

$\frac{1}{2}$  840  
120

*£. 720 Proof*

2 What is the value of a bill of 750*l.* Pennsylvania, or other like currency, in New-York, or North Carolina currency? *Answer 800*l.**

3 What sum of New-York currency is equal to 173*l.* 16*s.* in New-Jersey? *Answer 185*l.* 7*s.* 8*d.*  $\frac{1}{2}$*

4 Philadelphia, 28th 12mo. 1802,  
Exchange for 375*l.* Pennsylvania currency.

Thirty days after sight, pay to Charles Jackson, or order, three hundred seventy-five pounds, Pennsylvania currency, as per advice from thy friend,

Peter Simpson.

To Benjamin Brown,  
Merchant, Virginia.

How much Virginia currency, will discharge the above bill? *Answer 300*l.**

5 B, of Massachusetts received, in Pennsylvania currency, the following sums, viz. 76*l.* 17*s.* 8*d.*—200*l.*—and 170*l.* 10*s.* 11*d.* What sum is equal thereto in the state he resides in? *Answer 357*l.* 18*s.* 10*d.*  $\frac{1}{2}$*

6 How much South Carolina currency is equal to 1500*l.* of New Jersey? *Answer 933*l.* 6*s.* 8*d.**

7 A merchant of New-York owes 240*l.* to a planter in Virginia; how much ought he to be charged with in the *mer's books?* *Answer 180*l.**

8 New

8

New-York, 4th. 1mo. 1803.

Exchange for 562l. 13s. 8d.

Twelve days after sight please to pay to David Davis, or order, five hundred sixty-two pounds, thirteen shillings and eight pence, value received, and place the same to account, as per advice from thy friend,

Isaac Jones.

To Bradshaw Waters.

What sum, Georgia currency, will discharge this bill?

*Answer* 328l. 4s. 7d. $\frac{1}{2}$ 

9 C, of Connecticut, draws on D of Delaware, for, 104l. 16s. 9d. what sum in the latter currency will pay this draught?

*Answer* 131l. 0s. 11d. $\frac{3}{4}$ 

10 What sum, New York currency, is equal to 180l. in Massachusetts?

*Answer* 240l.

11 How much South Carolina currency is equal to 350l. Massachusetts money?

*Answer* 280l.

12 A bill of exchange for 475l being remitted from Georgia to New Jersey; what is the value of it in Jersey currency?

*Answer* 763l. 7s. 10d. $\frac{1}{4}$ 

13 If 472l. 16s. 8d. be transmitted from Georgia to North Carolina; what sum is it equal to in the latter state?

*Answer* 810l. 11s. 5d. $\frac{1}{4}$ 

14 How much Virginia currency will purchase a bill for 280l. South Carolina currency?

*Answer* 360l.

15 What is 96l. 16s. 9d. $\frac{3}{4}$  of Charlestown, South Carolina, worth in New-York?

*Answer* 166l. 0s. 3d.

16 Reduce 36791l. 14s. 4d. of New York to New Jersey currency.

*Facit* 34492l 4s. 8d. $\frac{1}{4}$ 

## CASE 2.

## FOREIGN EXCHANGE.

Accounts are kept in England, Ireland, and the West India Islands, in pounds, shillings, pence, and farthings; though their intrinsic values, in these places, are different.

A



## R U L E.

The various operations, in the exchanging of monies, are performed by the single Rule of Three, or by Practice.

Note. The par of exchange between the United States of America, and most other trading countries, may be ascertained by the tables in page 17.

## E X A M P L E S.

1 Philadelphia is indebted to London 1474*l*. 16*s*. currency; what sterling sum must be remitted, when the exchange is at 64 per cent.?

$$\begin{array}{r}
 \text{As } \begin{array}{c} \text{£.} \\ 1474 \\ \hline 41 \end{array} \text{ :: } \begin{array}{c} \text{£.} \\ 100 \\ \hline 25 \end{array} \text{ :: } \begin{array}{c} \text{£.} \\ 1474 \\ \hline 5 \end{array} \text{ } 16 \\
 \begin{array}{r} 7374 \\ \hline 5 \end{array} \text{ } 0 \\
 \begin{array}{r} 41 \overline{) 36870} \text{ } 0 \end{array} \begin{array}{c} \text{£.} \\ 899 \\ \hline 5 \end{array} \begin{array}{c} \text{s.} \\ 4 \frac{1}{4} \end{array} \text{ } \text{Answer.}
 \end{array}$$

2 London receives a bill of exchange from Philadelphia, for 943*l*. 17*s*. 5*d.*  $\frac{1}{4}$  sterling; for how much currency was it drawn, exchange being at 64 per cent?

$$\begin{array}{c|c|c|c|c|c}
 \text{£.} & & \text{£.} & \text{s.} & \text{d.} & \\
 \hline
 50 & \frac{1}{2} & 943 & 17 & 5 \frac{1}{4} & \\
 10 & \frac{1}{5} & 471 & 18 & 8 \frac{1}{5} & \\
 2 & \frac{1}{5} & 94 & 7 & 8 \frac{1}{5} & \\
 2 & \frac{1}{5} & 18 & 17 & 6 \frac{1}{5} & \\
 & & 18 & 17 & 6 \frac{1}{5} & 
 \end{array}$$

Answer £. 1547 18 11  $\frac{1}{5}$  Currency.

3 Jamaica is indebted to London 1470*l*. 12*s*. 8*d.* sterling; with how much currency will London be credited at Jamaica, when the exchange is at 36  $\frac{1}{5}$  per cent?

Answer 2007*l*. 8*s*. 3*d.*  $\frac{1}{4}$

4 Dublin draws upon London for 740*l*. 14*s*. 16*d.* Irish, exchange at 12 per cent. how much sterling will discharge this bill?

Answer 651*l*. 7*s*. 2*d.*  $\frac{1}{4}$

K 2

5 London

5 London remits to Ireland 65*l.* 14*s.* 11*d.*  $\frac{1}{2}$  sterling ;  
how much Irish must London be credited, exchange at 12  
per cent ?

*Answer* 729*l.* 19*s.* 2*d.*

6 Philadelphia, 20th 2mo. 1803.

Exchange for 452*l.* 10*s.* 6*d.* sterling.

Thirty days after sight of this my first of exchange, second and third of like tenor and date not paid, pay to Samuel Simms, or order, four hundred fifty-two pounds, ten shillings and six pence sterling, value received ; and place the same to account, as per advice from,

Peter Simpson.

Samuel Pimm, Merchant,  
London.

What is the value of this bill in Pennsylvania currency, exchange at 77  $\frac{1}{2}$  per cent ?

*Answer* 803*l.* 4*s.* 7*d.*  $\frac{1}{2}$

7 In a settlement between C of Philadelphia, and D of London, C is indebted 750*l.* 2*s.* 4*d.*  $\frac{1}{2}$  sterling ; what sum Pennsylvania currency is equivalent, exchange at 78 per cent ?

*Answer* 1335*l.* 4*s.* 2*d.*  $\frac{1}{2}$

8 How much sterling is equal to 1341*l.* 9*s.* 4*d.*  $\frac{1}{2}$  Pennsylvania currency, exchange at 67  $\frac{1}{2}$  per cent ?

*Answer* 800*l.* 17*s.* 6*d.*  $\frac{1}{2}$

9 What sum sterling will be equal to 260*l.* 8*s.* 6*d.* Virginia currency, exchange at 44 per cent ?

*Answer* 180*l.* 17*s.*

10 Purchased in Ireland effects to the value of 400*l.* 17*s.* 9*d.* of that place ; what sum Pennsylvania currency, will discharge the debt, exchange at 51  $\frac{1}{2}$  per cent ?

*Answer* 607*l.* 6*s.* 10*d.*  $\frac{1}{2}$

11 Philadelphia, 2d 3mo. 1803.

Exchange for 4226 livres, 12 sols, 8 deniers.

Thirty days after sight of this my second of Exchange, first of the same tenor and date not paid, pay to Thomas Broker, or order, four thousand two hundred and twenty-six livres, twelve sols and eight deniers, value received ; and place the same to account, as per advice from

Silas Stroud.

To Thomas Lamott,  
Merchant, London.

How much sterling is the above bill, at  $10d. \frac{1}{2}$  per livre?  
And what sum in Pennsylvania currency, at  $17d. \frac{1}{2}$  per livre?

£. s. d.  
*Answer* { 184 18  $3\frac{1}{2}$  Sterling.  
 308 3 10 Currency.

12 A Connecticut merchant imported goods from France, amounting, per invoice, to 49008 livres; how much currency of that state at  $15d.$  per livre, will they amount to; and how much sterling will discharge the debt, exchange being at par?

£. s. d.  
*Answer* { 3063 0 0 Currency.  
 2297 5 0 Sterling.

13 A merchant in Holland being desirous to turn 4376 florins currency into banco, the *agio* at 4 per cent. how many pounds Flemish banco must he receive?

*Answer* 701*l.* 1*sh.* 13*s.* 13*pen.*

14 P, of Philadelphia, receives of A, of Amsterdam, an invoice of goods amounting to 10235 *fl.* 17 *sh.* 8*pen.* how much Pennsylvania currency must be remitted to discharge the bill, at  $35d. \frac{1}{4}$  per florin? And what is the sum in sterling, exchange at 38*s.* 6*d.* Flemish per *l.* sterling?

£. s. d.  
*Answer* { 1503 7  $10\frac{1}{2}$  Currency.  
 886 4  $5\frac{1}{2}$  Sterling.

15 A bill for 2524 pezos, 7 *ria.* 33 *marv.* being remitted to Cadiz; what sum, Pennsylvania currency, is equal thereto, at 7*s.* 6*d.* per pezo?

*Answer* 946*l.* 17*s.* 5*d.*  $\frac{1}{2}$

16 A Virginia merchant sent goods to Norway, worth 1743*l.* 16*s.* Virginia currency; how many rix dollars, at 6*s.* each, must he receive?

*Answer* 5812*dol.* 4*s.*

17 A merchant of North Carolina shipped a quantity of flour, which, when disposed of, amounted to 1186 millreas, 500 reas; and received in return 17 pipes of wine; what was it per pipe, a millrea reckoned at 7*s.* 6*d.*?

*Answer* 26*l.* 3*s.* 5*d.*  $\frac{1}{2}$

18 In 2714 guilders, 15 stivers, how many pounds sterling; exchange at 35*s.* 6*d.* Flemish per *l.* sterling?

*Answer* 254*l.* 18*s.* 1*d.*  $\frac{3}{4}$

19 In 290*l.* 11*s.* 10*d.* sterling, how many pounds Flemish; exchange at 33*s.* 10*d.* Flemish per *l.* sterling, and *agio* at  $4\frac{1}{2}$  per cent?

*Answer* 513*l.* 14*s.* 1*d.*  
 20 London.



20 London is indebted to Genoa in 1710*l.* 16*s.* 4*d.* for how many pezos may Genoa draw on London, the exchange at 47*d.* $\frac{1}{2}$  per pezo? *Answer* 8644+

21 How many millreas will 1566*l.* 6*s.* 8*d.* amount to, exchange at 64*d.* per millrea?

*Answer* 5873 millreas 750 reas.

22 A merchant in Rotterdam remits 564*l.* 10*s.* 6*d.* Flemish to be paid in London; how much sterling money must he draw for, exchange at 34*s.* 4*d.* per *l.* sterling?

*Answer* 328*l.* 16*s.* 11*d.* $\frac{3}{4}$

23 Amsterdam changes on London 34*s.* 3*d.* per *l.* sterling, and on Lisbon, at 52*d.* Flemish, for 400 reas; how then ought the exchange to go between London and Lisbon?

*Answer* 75*d.* $\frac{1}{2}$  sterling nearly, per millrea.

24 A, at Paris, draws on B, of London for 1200 crowns at 55*d.* sterling per crown; for the value whereof, B draws again on A at 56*d.* sterling per crown; besides commission; per cent. what did A gain or lose by this transaction?

*Answer* A gained 15 $\frac{1}{2}$  + crowns.

## VULGAR FRACTIONS.

**A** VULGAR FRACTION is a part, or parts of an integer, and is noted thus,  $\frac{1}{8}$ , one eighth;  $\frac{7}{8}$ , seven eighths. The upper number is called the numerator, and shews the part, or parts, expressed by the fraction; the lower number is called the denominator, and denotes the number of such parts contained in a unit.

Vulgar fractions are either proper, improper, compound, or mixt.

A proper fraction is one of which the numerator is less than the denominator; thus,  $\frac{7}{8}$ ,  $\frac{1}{12}$ .

An improper fraction is one of which the numerator is equal to, or greater than the denominator; thus,  $\frac{8}{8}$ ,  $\frac{8}{5}$ .

A compound fraction is, a fraction of a fraction; as,  $\frac{1}{2}$  of  $\frac{7}{8}$ , &c.

A mixt number consists of a whole number and a fraction; as,  $7\frac{1}{2}$ .

A mixt fraction has a fraction annexed either to its numerator or denominator; as,  $\frac{4}{7}\frac{2}{9}$ , or  $1\frac{7}{11}\frac{1}{3}$ .

REDUCTION

REDUCTION OF VULGAR FRACTIONS.

CASE. 1.

To reduce a fraction to its lowest terms;

RULE.

Divide the greater term by the less, and that divisor by the remainder, till nothing be left; the last divisor will be the common measure: by which divide both terms, for the fraction required: or,

Take the aliquot parts of both terms continually, till in their lowest terms.

*Note.* If the common measure be 1, the fraction is already in its lowest terms. Ciphers to the right hand of both terms may be rejected, thus,  $\frac{700}{800} = \frac{7}{8}$

EXAMPLES.

1 Reduce  $\frac{48}{72}$  to its lowest terms.

Or,

$$\frac{48}{72} = \frac{24}{36} = \frac{6}{9} \text{ Facit} \quad \begin{array}{r} 48 \overline{) 56(1} \\ \underline{48} \end{array} \quad 8) \frac{48}{72} = \frac{6}{9} \text{ Facit.}$$

$$\text{Com. measure } 8) \frac{48}{72} \begin{array}{r} 48(6 \\ \underline{48} \end{array}$$

0

2 Reduce  $\frac{72}{96}$  to its lowest terms.

*Facit.*  $\frac{3}{4}$ .

3 Reduce  $\frac{84}{112}$  to its lowest terms.

$\frac{3}{4}$ .

4 Reduce  $\frac{60}{84}$  to its lowest terms.

$\frac{5}{7}$ .

5 Reduce  $\frac{48}{72}$  to its lowest terms.

$\frac{2}{3}$ .

6 Reduce  $\frac{98}{147}$  to its lowest terms.

$\frac{2}{3}$ .

CASE 2.

To reduce several fractions to others, retaining the same value, and to have one common denominator.

RULE.

Reduce the given fractions to their lowest terms; then multiply each numerator into all the denominators but its own, for its respective numerator; and all the denominators into each other, for a common denominator.

*Note.* This case, and case 1, prove each other.

EXAMPLES.

## E X A M P L E S.

1 Reduce  $\frac{7}{8}$ ,  $\frac{9}{10}$  and  $\frac{1}{12}$  to a common denominator.

$$\left. \begin{array}{l} 7 \times 10 \times 12 = 840 \\ 9 \times 8 \times 12 = 864 \\ 11 \times 8 \times 10 = 880 \end{array} \right\} \text{Numerators.}$$

$$8 \times 10 \times 12 = 960 \text{ Denominator. } \text{Facit } \left\{ \frac{840}{960}, \frac{864}{960} \text{ and } \frac{880}{960} \right\}.$$

2 Reduce  $\frac{6}{10}$ ,  $\frac{4}{8}$ ,  $\frac{1}{9}$  and  $\frac{6}{7}$ , to a common denominator.

$$\text{Facit } \frac{378}{630}, \frac{315}{630}, \frac{70}{630} \text{ and } \frac{540}{630}.$$

3 Reduce  $\frac{4}{9}$ ,  $\frac{7}{11}$ ,  $\frac{6}{7}$  and  $\frac{1}{2}$  to a common denominator.

$$\text{Facit } \frac{616}{1188}, \frac{882}{1188}, \frac{1188}{1188} \text{ and } \frac{594}{1188}.$$

4 Reduce  $\frac{6}{9}$ ,  $\frac{2}{7}$ ,  $\frac{1}{3}$  and  $\frac{7}{8}$  to a common denominator.

$$\text{Facit } \frac{336}{252}, \frac{144}{252}, \frac{84}{252} \text{ and } \frac{441}{252}.$$

5 Reduce  $\frac{4}{7}$ ,  $\frac{1}{2}$ ,  $\frac{5}{8}$  and  $\frac{2}{9}$  to a common denominator.

$$\text{Facit } \frac{120}{252}, \frac{126}{252}, \frac{160}{252} \text{ and } \frac{60}{252}.$$

## C A S E 3.

To reduce a mixt number to an improper fraction.

## R U L E.

To the product of the whole number with the denominator, add the numerator, for a new numerator, under which place the given denominator.

## E X A M P L E S.

1 Reduce  $12\frac{1}{7}$  to an improper fraction.

$$12 \times 7 \times 15 = 117 \text{ Facit}$$

2 Reduce  $19\frac{1}{8}$  to an improper fraction.

$$\text{Facit } \frac{154}{158}.$$

3 Reduce  $16\frac{1}{100}$  to an improper fraction.

$$\frac{161}{160}.$$

4 Reduce  $100\frac{1}{9}$  to an improper fraction.

$$\frac{901}{9}.$$

5 Reduce  $514\frac{5}{10}$  to an improper fraction.

$$\frac{5239}{2}.$$

6 Reduce  $47\frac{1}{1400}$  to an improper fraction.

$$\frac{65801}{14}.$$

## C A S E 4.

To Reduce an improper fraction to a whole or mixt number.

## R U L E.



## R U L E.

Divide the upper term by the lower.

Note. This case, and case 3, prove each other.

## E X A M P L E S.

- 1 Reduce  $\frac{219}{17}$  to its proper terms.

$17 \overline{) 219} (12 \frac{15}{17}$  *Facit.*

17

49

34

15

- 2 Reduce  $\frac{141}{17}$  to its proper terms.

*Facit*  $8 \frac{5}{17}$ .

- 3 Reduce  $\frac{126}{17}$  to its proper terms.

$2 \frac{10}{17}$ .

- 4 Reduce  $\frac{961}{17}$  to its proper terms.

$56 \frac{9}{17}$ .

- 5 Reduce  $\frac{13}{17}$  to its proper terms.

$1 \frac{6}{17}$ .

- 6 Reduce  $\frac{3848}{17}$  to its proper terms.

$183 \frac{11}{17}$ .

## C A S E 5.

To reduce a compound fraction to a single one ;

## R U L E.

Multiply all the numerators together for a new numerator, and all the denominators for a new denominator.

Note. Like figures in the numerators and denominators may be cancelled, and frequently others contracted, by taking their aliquot parts.

## E X A M P L E S.

- 1 Reduce  $\frac{2}{3}$  of  $\frac{1}{4}$  of  $\frac{4}{5}$  to a single fraction.

$2 \times 3 \times 4 = 24 = \frac{24}{24} = \frac{2}{3}$  } *Facit.* Or,  $\frac{2}{3}$  of  $\frac{1}{4}$  of  $\frac{4}{5} = \frac{2}{3} \times \frac{1}{4} \times \frac{4}{5} = \frac{2}{3} \times \frac{1}{5} = \frac{2}{15}$ .

Or cancelled,  $\frac{2}{3}$  of  $\frac{1}{4}$  of  $\frac{4}{5} = \frac{2}{3} \times \frac{1}{4} \times \frac{4}{5} = \frac{2}{3} \times \frac{1}{5} = \frac{2}{15}$  as before.

- 2 Reduce  $\frac{1}{2}$  of  $\frac{3}{4}$  of  $\frac{1}{2}$  to a single fraction.

*Facit*  $\frac{1}{4}$ .

- 3 Reduce  $\frac{7}{8}$  of  $\frac{2}{3}$  of  $\frac{9}{10}$  to a single fraction.

$\frac{7}{40}$ .

- 4 Reduce  $\frac{1}{2}$  of  $\frac{1}{3}$  of  $\frac{1}{4}$  to a single fraction.

$\frac{1}{24}$ .

- 5 Reduce  $\frac{2}{3}$  of  $\frac{4}{5}$  of  $\frac{1}{2}$  to a single fraction.

$\frac{4}{15}$ .

- 6 Reduce  $\frac{1}{2}$  of  $\frac{2}{3}$  of  $\frac{1}{4}$  to a single fraction.

$\frac{1}{12}$ .

## C A S E.

## C A S E 6.

To reduce the fraction of one denomination to the fraction of another, but greater, retaining the same value;

## R U L E.

Make it a compound fraction, by comparing it with all the denominations between it and that to which it is to be reduced; which fraction, reduce to a single one.

## E X A M P L E S.

- 1 Reduce  $\frac{5}{8}$  of a penny to the fraction of a pound.  
 $\frac{5}{8}$  of  $\frac{1}{12}$  of  $\frac{1}{20} = \frac{5}{1440} = \frac{1}{288} \text{ } \mathcal{L}$ . *Facit.*
- 2 Reduce  $\frac{1}{2}$  of a farthing to the fraction of a shilling.  
 $\text{Facit } \frac{1}{40} \text{ s.}$
- 3 Reduce  $\frac{8}{9}$  of an oz. troy to the fraction of a lb.  
 $\text{Facit } \frac{2}{27} \text{ lb.}$
- 4 Reduce  $\frac{6}{7}$  of a lb. avoirdupois to the fraction of C. wt.  
 $\text{Facit } \frac{3}{105} \text{ C. wt.}$
- 5 Reduce  $\frac{9}{11}$  of a pint of wine to the fraction of a hhd.  
 $\text{Facit } \frac{1}{11} \text{ hhd.}$
- 6 Reduce  $\frac{10}{11}$  of a minute to the fraction of a day.  
 $\text{Facit } \frac{1}{132} \text{ day.}$

## C A S E 7.

To reduce the fraction of one denomination to the fraction of another, but less, retaining the same value;

## R U L E.

Multiply the given numerator by the parts of the denomination between it and that to which it is to be reduced, for a new numerator, and place it over the given denominator; which reduce to its lowest terms.

Note. This case, and case 6, prove each other.

## E X A M P L E S.

- 1 Reduce  $\frac{1}{1440}$  of a pound to the fraction of a penny.  
 $5 \times 20 \times 12 = \frac{1200}{1440} = \frac{5}{12} \text{ d.}$  *Facit.*
- 2 Reduce  $\frac{1}{40}$  of a shilling to the fraction of a farthing.  
 $\text{Facit } \frac{1}{4} \text{ qr.}$
- 3 Reduce  $\frac{2}{11}$  of a lb. troy to the fraction of an oz.  
 $\text{Facit } \frac{2}{11} \text{ oz.}$
- 5 Reduce

- 4 Reduce  $\frac{3}{87}$  of an *Cwt.* to the fraction of a *lb.*  
*Facit*  $\frac{6}{7}$  *lb.*
- 5 Reduce  $\frac{1}{18}$  of a *hhd.* to the fraction of a pint.  
*Facit*  $\frac{9}{1}$  *pt.*
- 6 Reduce  $\frac{1}{184}$  of a day to the fraction of a minute.  
*Facit*  $\frac{10}{1}$  *min.*

C A S E 8.

To reduce the value or quantity of a fraction, to the known parts of an integer;

R U L E.

Multiply the numerator by the common parts of the integer, and divide by the denominator.

E X A M P L E S.

- 1 Reduce  $\frac{3}{4}$  of a pound to its proper value.  
 $\frac{3}{4}$  of  $\frac{20}{1} = \frac{60}{4} = 15s. 4d.$  *Facit.*
- 2 Reduce  $\frac{1}{3}$  of a shilling to its value. *Facit*  $5d. \frac{1}{3}$
- 3 Reduce  $\frac{1}{7}$  of  $5l. 9s.$  to its value.  $4l. 13s. 5d. \frac{1}{7}$
- 4 Reduce  $\frac{1}{2}$  of a *lb. troy* to its value.  $9oz.$
- 5 Reduce  $\frac{1}{17}$  of  $10C. 1qr. 12lb.$  to its value.  
*Facit*  $8C. 1qr. 25lb. 10oz. 7\frac{1}{17}dr.$
- 6 Reduce  $\frac{1}{4}$  of a mile to its value.  
*Facit*  $4fur. 125yds. 2ft. 1in. 2\frac{1}{4}b.c.$
- 7 Reduce  $\frac{1}{2}$  of an ell English to its value. *Facit*  $1yd.$
- 8 What is the value of  $\frac{1}{4}$  of a yard? *Answer*  $3qr. 1\frac{1}{4}na.$
- 9 What is the value of  $\frac{1}{10}$  of an acre?  $1R. 2\frac{2}{10}pls.$
- 10 What is the value of  $\frac{1}{15}$  of a day?  $7hr. 12min.$
- 11 What is the value of  $\frac{1}{8}$  of a dollar?  $11\frac{1}{8}d.$
- 12 What is the value of  $\frac{1}{12}$  of a French crown?  
*Answer*  $8\frac{1}{12}d.$
- 13 What is the value sterling of  $\frac{1}{10}$  of an English guinea; and what in Pennsylvania currency?  
*Answer*  $4s. 8d.$  sterling,  $7s. 9d. \frac{1}{10}$  Pennsylvania currency.
- 14 What is the value sterling of  $\frac{1}{2}$  of a moidore; and what in Pennsylvania currency?  
*Answer*  $1l. 1s. 7d. \frac{1}{2}$  sterling,  $1l. 16s.$  currency.

C A S E 9.

To reduce any given value, or quantity, to the fraction of any greater denomination of the same kind;

L

R U L E.

## R U L E.

Reduce the given quantity to its lowest term mentioned, for a numerator, and the integer into the same name for a denominator; which reduce to their lowest terms.

Note 1. If a fraction be given, multiply both parts by the denominator thereof, and to the numerator add the numerator of the given fraction.

2. Case 8 and 9 prove each other.

## E X A M P L E S.

1 Reduce 13s. 4d. to the fraction of a pound.

$$\begin{array}{rcl} s. & d. & \\ 13 & 4 = \frac{160}{20} = \frac{1}{3} \text{ £. } \} & \text{Facit} \end{array}$$

2 Reduce 5d.  $\frac{1}{4}$  to the fraction of a shilling. *Facit*  $\frac{1}{12}$  s.

3 Reduce 9oz. troy to the fraction of a lb. *Facit*  $\frac{3}{8}$  lb.

4 What part of 5l. 9s. is 4l. 13s. 5d.  $\frac{1}{7}$ ? *Answer*  $\frac{6}{7}$

5 Reduce 3C. 8lb. 9oz. 13dr.  $\frac{1}{7}$  to the fraction of a ton. *Facit*  $\frac{2}{11}$  ton.

6 Reduce 2f. 8in.  $1\frac{1}{2}$  b. to the fraction of a yard. *Facit*  $\frac{9}{10}$  yd.

7 Reduce 1yd. to the fraction of an ell English. *Facit*  $\frac{4}{7}$  ell.

8 Reduce 3qr. 2na. to the fraction of a yard. *Facit*  $\frac{1}{12}$  yd.

9 Reduce 1R. 30P. to the fraction of an acre. *Facit*  $\frac{7}{8}$  acre.

10 Reduce 13hr. 39min. to the fraction of a day, *Facit*  $\frac{2}{3}$  day.

## C A S E 10.\*

To reduce fractions from one denomination to another of the same value, having the numerator of the required fraction given;

## R U L E.

As the numerator of the given fraction,  
Is to the denominator;  
So is the numerator of the intended fraction,  
To its denominator.

\* Note. As the tenth, eleventh and twelfth cases are seldom useful, they may be taught or omitted, at the option of the teacher.

## E X A M P L E S.

## EXAMPLES.

1 Reduce  $\frac{3}{4}$  to a fraction of the same value, whose numerator shall be 15.

As  $3 :: 4 :: 15 :: 20$  *Facit*  $\frac{15}{20} = \frac{3}{4}$ .

2 Reduce  $\frac{7}{8}$  to a fraction of the same value, the numerator of which shall be 42. *Facit*  $\frac{42}{48}$

3 Reduce  $\frac{3}{4}$  to a fraction of the same value, the numerator of which shall be 34. *Facit*  $\frac{34}{45\frac{1}{3}}$

4 Reduce  $\frac{5}{8}$  to a fraction of the same value, the numerator of which shall be 73. *Facit*  $\frac{73}{115\frac{1}{5}}$

## CASE II.

To reduce fractions from one denomination to another of the same value, having the denominator of the required fraction given;

## RULE.

As the denominator of the given fraction,

Is to its numerator;

So is the denominator of the intended fraction,

To its numerator.

Note. Case 10 and 11 prove each other.

## EXAMPLES.

1 Reduce  $\frac{3}{4}$  to a fraction of the same value, whose denominator shall be 20.

As  $4 :: 3 :: 20 :: 15$  *Facit*  $\frac{15}{20} = \frac{3}{4}$

2 Reduce  $\frac{7}{8}$  to a fraction of the same value, the denominator of which shall be 49. *Facit*  $\frac{44\frac{1}{2}}{49}$

3 Reduce  $\frac{3}{4}$  to a fraction of the same value, the denominator of which shall be 46. *Facit*  $\frac{34\frac{1}{2}}{46}$

4 Reduce  $\frac{5}{8}$  to a fraction of the same value, the denominator of which shall be  $131\frac{1}{2}$ . *Facit*  $\frac{79\frac{1}{2}}{131\frac{1}{2}}$

## CASE 12.

To reduce a mixt fraction to a simple one;

## RULE.

Multiply each term of the principal fraction by the denominator of that annexed, for the like term of the simple fraction, adding the annexed numerator to the product of the term to which it belongs.

## Addition of Vulgar Fractions.

## E X A M P L E S.

- 1 Reduce
- $\frac{42}{49} + \frac{7}{8}$
- to a simple fraction.

$$\left. \begin{array}{l} 42 \times 8 + 7 = 343 \\ 49 \times 8 = 392 \end{array} \right\} = \frac{343}{392} \text{ Facit}$$

- 2 Reduce
- $\frac{73}{131} + \frac{5}{2}$
- to a simple fraction.

$$\left. \begin{array}{l} 73 \times 5 = 365 \\ 131 \times 5 + 2 = 657 \end{array} \right\} = \frac{365}{657} \text{ Facit}$$

- 3 Reduce
- $\frac{3}{8} + \frac{1}{2}$
- to a simple fraction.

Facit  $\frac{5}{8}$ 

- 4 Reduce
- $\frac{3}{4} + \frac{1}{3}$
- to a simple fraction.

 $\frac{7}{12}$ 

- 5 Reduce
- $\frac{1}{3} + \frac{2}{5}$
- to a simple fraction.

 $\frac{7}{15}$ 

- 6 Reduce
- $\frac{7}{9} + \frac{1}{3}$
- to a simple fraction.

 $\frac{10}{9}$ 

## ADDITION OF VULGAR FRACTIONS.

## R U L E.

Reduce the given fractions (if necessary) to simple fractions, and to a common denominator (omitting integers): Place the sum of the numerators over the common denominator; then, to the value of said fractions, add the integers (if any.)

If fractions be of different integers, find their values separately, and add as in compound addition.

## E X A M P L E S.

- 1 Add
- $\frac{1}{2}$
- and
- $\frac{7}{8}$
- together.

$$\frac{1}{2} + \frac{7}{8} = \frac{4}{8} + \frac{7}{8} = \frac{11}{8} = 1\frac{3}{8} \text{ Facit}$$

- 2 Add
- $\frac{1}{10}$
- ,
- $\frac{1}{12}$
- , and
- $\frac{1}{6}$
- together.

$$\text{Facit } 2\frac{11}{60}$$

- 3 Add 19, 7 and
- $\frac{1}{2}$
- of
- $\frac{3}{4}$
- together.

$$26\frac{1}{4}$$

- 4 Add
- $\frac{1}{2}$
- of
- $\frac{7}{8}$
- , and
- $\frac{4}{5}$
- of
- $\frac{1}{2}$
- together.

$$1\frac{11}{40}$$

- 5 Add
- $\frac{1}{3}$
- of 95, and
- $\frac{7}{8}$
- of 14 together.

$$43\frac{11}{24}$$

- 6 Add
- $\frac{1}{3}$
- , and 17
- $\frac{1}{2}$
- together.

$$18\frac{5}{6}$$

- 7 Add 12
- $\frac{1}{2}$
- , 3
- $\frac{3}{4}$
- , and 4
- $\frac{1}{4}$
- together.

$$20\frac{11}{4}$$

- 8 Add 6,
- $\frac{7}{8}$
- of
- $\frac{9}{10}$
- ,
- $\frac{4}{5}$
- of
- $\frac{1}{2}$
- , and 7
- $\frac{1}{2}$
- together.

$$14\frac{11}{40}$$

- 9 Add
- $\frac{1}{3}$
- ,
- $\frac{4}{5}$
- of
- $\frac{1}{3}$
- , and 9
- $\frac{3}{10}$
- together.

$$10\frac{8}{15}$$

- 10 Add
- $\frac{1}{4}$
- of a penny to
- $\frac{1}{5}$
- of a pound.

$$2s. 3d. 1qr. \frac{1}{4}$$

- 11 Add
- $\frac{7}{8}$
- of a pound to
- $\frac{1}{4}$
- of a shilling.

$$18s. 3d.$$

- 12 Add
- $\frac{1}{2}$
- of a lb. troy to
- $\frac{1}{3}$
- of an oz.

$$\text{Facit } 6oz. 11dw. 16gr.$$

$$13 \text{ Add}$$



13 Add  $\frac{4}{7}$  of a ton to  $\frac{9}{10}$  of an Cwt.  
Facit 12C. 1qr. 8lb. 12oz.  $12\frac{4}{5}$ dr.

14 Add  $\frac{3}{4}$  of a mile to  $\frac{7}{10}$  of a furlong.  
Facit 6fur. 28pls.

15 Add  $\frac{1}{2}$  of a yard to  $\frac{2}{3}$  of a foot.  
Facit 2ft. 2in.

16 Add  $\frac{1}{3}$  of a day to  $\frac{1}{2}$  of an hour.  
Facit 8hr. 30min.

17 Add  $\frac{1}{3}$  of a week,  $\frac{1}{4}$  of a day, and  $\frac{1}{2}$  of an hour together.  
Facit 2da.  $14\frac{1}{2}$ hr.

18 Add  $\frac{2}{3}$  of a yard,  $\frac{1}{4}$  of a foot, and  $\frac{7}{8}$  of a mile together.  
Facit 154oyd. 2ft. 9in.

19 What is the sum of  $\frac{1}{7}$  of a £.  $\frac{3}{9}$  of a shilling and  $\frac{5}{12}$  of a penny?  
Answer 3s. 1d.  $1\frac{1}{2}$ qr.

20 What is the sum of  $\frac{1}{7}$  of 15£.  $3\frac{3}{4}$ £.  $\frac{1}{3}$  of  $\frac{1}{7}$  of  $\frac{2}{3}$  of a £. and  $\frac{2}{3}$  of  $\frac{3}{7}$  of a shilling?  
Answer 7l. 17s. 5d.  $0\frac{4}{5}$ qr.

21 Add  $\frac{2}{3}$  of 12£.  $+ 4\frac{3}{4}$ £.  $+ \frac{1}{3}$  of  $\frac{9}{10}$  of a £.  $+ \frac{1}{5}$  of  $\frac{1}{6}$  of a shilling into one sum.  
Facit 9l. 8s. 8d.  $0\frac{3}{5}$ qr.

22 If a merchant own  $\frac{3}{5}$  of a ship, valued at 1500l. and buys another persons share of her, which is  $\frac{5}{16}$ ; what part belongs to him, and what is it worth?

Answer  $\frac{11}{16}$ , worth 1031l. 5s.

## SUBTRACTION OF VULGAR FRACTIONS.

### R U L E.

Prepare the fractions as in addition, and subtract the lower numerator from the upper, placing the difference over the common denominator.

If the lower numerator be the greater, subtract it from the common denominator, adding in the upper numerator and carry 1 to the units place of the integer.

If fractions be of different integers, find their values separately, and subtract as in compound subtraction.

### E X A M P L E S.

1 From  $\frac{111}{112}$  take  $\frac{3}{4}$ .  
 $\frac{111}{112} - \frac{3}{4} = \frac{444}{448} - \frac{336}{448} = \frac{108}{448} = \frac{27}{112}$  Facit,

2 From  $\frac{107}{105}$  take  $\frac{3}{4}$ .

3 From  $96\frac{1}{2}$  take  $14\frac{3}{4}$ .

4 From 96 take  $\frac{3}{5}$ .

L 2

Facit  $\frac{370}{100}$   
81  $\frac{70}{100}$   
95  $\frac{30}{100}$   
5 From

- 5 From  $\frac{3}{4}$  of 76, take  $\frac{1}{2}$  of 21. *Facit* 9  $\frac{7}{11}$
- 6 From  $1\frac{1}{2}$ , take  $\frac{1}{2}$  of  $\frac{2}{3}$  of  $\frac{1}{4}$ .  $\frac{1}{21}$
- 7 From  $71\frac{1}{2}$ , take  $\frac{1}{6}$ .  $70\frac{23}{34}$
- 8 From  $14\frac{1}{4}$ , take  $\frac{2}{3}$  of 19.  $1\frac{1}{11}$
- 9 From  $\frac{1}{2}$  of a £. take  $\frac{1}{3}$  of a shilling. *9s. 3d.*
- 10 From  $\frac{1}{2}$  of a shilling, take  $\frac{1}{3}$  of a penny *5d.  $\frac{1}{4}$*
- 11 From  $\frac{1}{2}$  of an oz. troy, take  $\frac{1}{6}$  of a dwt. *Facit 11dwt. 3gr.*
- 12 From  $\frac{1}{2}$  of an C.wt. take  $\frac{1}{12}$  of a lb. *Facit 1qr. 27lb. 6oz. 10  $\frac{2}{3}$  dr.*
- 13 From  $\frac{2}{3}$  of a league, take  $\frac{1}{10}$  of a mile. *Facit 1 M. 2fur. 16pls.*
- 14 From 1 ell English, take  $\frac{1}{10}$  of a quarter. *Facit 1yd. 1  $\frac{1}{3}$  na.*
- 15 From 7 weeks, take 9  $\frac{1}{10}$  days. *Facit 5w. 4da. 7hr. 12min.*
- 16 From 4 days, 7  $\frac{1}{2}$  hours, take 1 day, 9  $\frac{1}{10}$  hours. *Facit 2d. 22  $\frac{1}{3}$  hr.*
- 17 Borrowed 5  $\frac{1}{2}$  £. paid  $\frac{2}{7}$  of 4  $\frac{1}{8}$  £. what remains! *Answer 4l. 3s. 8d. 1  $\frac{1}{7}$  qr.*
- 18 What is the difference between  $\frac{2}{3}$  of a £. and  $\frac{2}{3}$  of  $\frac{1}{4}$  of a shilling? *Answer 10s. 7d. 1  $\frac{1}{3}$  qr.*
- 19 Take  $\frac{1}{3}$  of a shilling from  $\frac{2}{7}$  of 5  $\frac{1}{8}$  £. and what is left? *Answer 1l. 8s. 11  $\frac{1}{3}$  d.*
- 20 If a merchant own  $\frac{2}{3}$  of a ship, valued at 900l. and sells  $\frac{1}{3}$  of his share; what part has he left, and what is it worth? *Answer  $\frac{1}{3}$  worth 187l. 10s.*

## MULTIPLICATION OF VULGAR FRACTIONS.

### R U L E.

If a compound fraction, or mixt number be given, reduce them to single, or improper fractions: multiply the numerators together for a new numerator and the denominators for a new denominator.

### E X A M P L E S.

Multiply  $\frac{3}{4}$  by  $\frac{1}{11}$ .

$$\frac{3}{4} \times \frac{1}{11} = \frac{3}{44} \text{ Facit.}$$

Multiply  $\frac{4}{5}$  by  $\frac{7}{9}$

$$\frac{4}{5} \times \frac{7}{9} = \frac{28}{45} \text{ Facit}$$

3 Multiply  $\frac{7}{9}$

# Division of Vulgar Fractions.

127

- 3 Multiply  $\frac{1}{2}$  of  $\frac{4}{5}$  by  $\frac{7}{10}$  of  $\frac{11}{12}$ . *Facit*  $\frac{77}{360}$
- 4 Multiply  $7\frac{1}{4}$  by  $8\frac{1}{2}$ . 61  $\frac{5}{8}$
- 5 Multiply  $4\frac{1}{2}$  by  $\frac{1}{8}$ .  $\frac{9}{16}$
- 6 Multiply  $\frac{7}{8}$  by  $13\frac{9}{10}$ . 12  $\frac{3}{10}$
- 7 Multiply  $\frac{1}{2}$  of 7 by  $\frac{3}{8}$ .  $1\frac{3}{4}$
- 8 Multiply  $\frac{3}{5}$  of 8 by  $\frac{7}{9}$  of 5. 21
- 9 Multiply  $\frac{2}{3}$  by  $\frac{4}{9}$  of 11.  $2\frac{8}{9}$
- 10 Multiply  $\frac{2}{3}$  of 91 by  $71\frac{1}{2}$ . 5205  $\frac{1}{5}$
- 11 Multiply  $12\frac{3}{5}$  by  $\frac{1}{3}$  of 7.  $29\frac{2}{5}$
- 12 Multiply  $7\frac{1}{2}$  by  $9\frac{1}{4}$ .  $69\frac{3}{8}$
- 13 What is the product of  $\frac{2}{9}$  of  $\frac{3}{5}$ , and  $\frac{5}{8}$  of  $3\frac{2}{7}$ ? *Answer*  $2\frac{3}{84}$
- 14 What is the product of  $5 \times \frac{3}{5} \times \frac{2}{7}$  of  $\frac{1}{3}$ ,  $\times 4\frac{1}{6}$ ? *Answer*  $2\frac{8}{21}$
- 15 What is the continued product of  $\frac{2}{3}$ ,  $3\frac{1}{4}$ , 5, and  $\frac{1}{4}$  of  $\frac{1}{5}$ ? *Answer*  $4\frac{1}{8}$
- 16 If  $3\frac{2}{3}$  be multiplied by  $\frac{1}{7}$ , and this product again by  $\frac{3}{5}$  of  $\frac{1}{4}$ , what is the last product? *Answer*  $\frac{1}{240}$

## DIVISION OF VULGAR FRACTIONS.

### R U L E.

Prepare the fractions, if necessary, as in multiplication: multiply the denominator of the divisor into the numerator of the dividend for a numerator; and the numerator of the divisor into the denominator of the dividend for a denominator.

### E X A M P L E S.

- 1 Divide  $\frac{17}{24}$  by  $\frac{1}{3}$ .  $\frac{17}{24} \div \frac{1}{3} = 1\frac{11}{8}$  *Facit*. Or thus,  $\frac{17}{24} \times \frac{3}{1} = 1\frac{11}{8}$
- 2 Divide  $\frac{11}{10}$  by 7. *Facit*  $\frac{11}{70}$
- 3 Divide  $\frac{1}{3}$  by  $\frac{7}{10}$ .  $1\frac{1}{9}$
- 4 Divide  $1\frac{1}{2}$  by  $4\frac{5}{10}$ .  $\frac{5}{10}$
- 5 Divide  $\frac{7}{5}$  by 4.  $\frac{7}{20}$
- 6 Divide 4 by 7.  $4\frac{4}{7}$
- 7 Divide  $\frac{1}{5}$  of 19 by  $\frac{2}{3}$  of  $\frac{1}{4}$ .  $7\frac{1}{2}$
- 8 Divide  $\frac{1}{3}$  of  $\frac{2}{7}$  by  $\frac{3}{5}$  of  $\frac{3}{4}$ .  $1\frac{1}{2}$
- 9 Divide  $\frac{2}{3}$  of  $\frac{3}{4}$  by  $\frac{1}{5}$  of  $\frac{3}{4}$ .  $2\frac{1}{2}$
- 10 Divide  $4\frac{5}{9}$  by  $\frac{5}{9}$  of 4.  $11\frac{1}{2}$

## 128 *The Single Rule of Three in V. Fractions.*

- 11 Divide  $\frac{5}{6}$  of 4 by  $4\frac{5}{8}$ . *Facit*  $\frac{20}{48}$   
 12 Divide  $\frac{7}{8}$  of 6 by  $\frac{1}{4}$  of  $\frac{6}{7}$  of  $\frac{1}{2}$ .  $8\frac{1}{17}$   
 13 What is the quotient of  $7\frac{1}{2}$  divided by  $9\frac{5}{8}$ ? *Answer*  $\frac{34}{43}$   
 14 What is the quotient of  $\frac{2}{3}$  of  $\frac{1}{4}$ , divided by  $\frac{5}{8}$  of  $7\frac{1}{2}$ ? *Answer*  $\frac{7}{17}$   
 15 What is the quotient of  $5205\frac{1}{2}$  divided by  $\frac{4}{5}$  of 91? *Answer*  $71\frac{1}{2}$

## THE SINGLE RULE OF THREE IN VULGAR FRACTIONS.

### DIRECT PROPORTION.

#### R U L E.

Prepare the given terms, if necessary, by reduction, and state them as in whole numbers; multiply the second and third terms together, and divide that product by the first: Or,

Invert the dividing term, and multiply the three together for the fractional answer.

*Note.* When the dividing term is inverted, the note to case 5 in reduction is applicable here.

#### E X A M P L E S.

- 1 If  $\frac{1}{2}$  of a yard cost  $\frac{7}{8}$  £. what cost  $\frac{1}{4}$  yd.  
 As  $\frac{1}{2} :: \frac{7}{8} :: \frac{1}{4} :: \frac{7}{16} = \frac{1}{2} = 3s. 4d.$  *Answer*

Or, Cancelled;  $\frac{9 \cancel{1} 3}{3 \cancel{1} 4} = \frac{1}{6} \text{ £.} = 3s. 4d.$

- 2 If  $\frac{1}{11}$  lb of sugar cost  $\frac{7}{8}s.$  what cost  $\frac{3}{4}$  lb?

*Answer* 4d. 3qr.  $\frac{165}{22}$

- 3 If  $\frac{4}{7}$  of an ell English cost  $\frac{7}{8}$  £. what is that per ell?

*Answer* 18s. 10d.  $\frac{2}{3}$

- 4 When 2 oz. of silver cost 16  $\frac{1}{2}s.$  what is the value of  $\frac{3}{4}$  oz?

*Answer* 6s 1d. 3qr.  $\frac{1}{2}$

- 5 If  $6\frac{1}{2}$  yds. cost 18s. what buys  $9\frac{1}{2}$  yds?

*Answer* 1l. 5s. 7d. 1qr.  $\frac{2}{3}$

- 6 Sold 500 bushels of wheat, at  $56\frac{1}{2}d.$  per bu. what sum passes to the credit of that article?

*Answer* 117l. 18s. 4d.

*The Single Rule of Three in V. Fractions.* 129

- 7 If  $1\frac{1}{2}$  yd. cost 9s. what is the value of  $16\frac{1}{2}$  yds?  
*Answer* 5l. 17s.
- 8 What sum pays for 100 yds. of cloth, at  $17\frac{1}{2}$ s. per yd?  
*Answer* 86l.
- 9 At  $5\frac{1}{2}$ s. per oz. what are 16  $\frac{1}{17}$  oz. of silver worth?  
*Answer* 4l. 12s.  $1\frac{1}{2}$ qr.
- 10 If  $\frac{2}{5}$  Cwt. cost  $14\frac{4}{5}$  £. what will  $7\frac{1}{2}$  Cwt. amount to?  
*Answer* 118l. 6s. 8d.
- 11 If  $\frac{1}{2}$  of an ell English be worth  $\frac{2}{3}$  of 19s. what is the value of 7 ells?  
*Answer* 7l. 7s. 9d.  $1\frac{1}{2}$ qr.
- 12 8lb. of tobacco cost 4s. 9d.  $\frac{1}{2}$ , what is that per lb?  
*Answer* 7d.  $\frac{1}{2}$
- 13 How much cash will purchase 4 pieces of cloth, each  $27\frac{1}{2}$  yds. at  $15\frac{1}{2}$ s. per yd?  
*Answer* 85l. 10s.  $11d\frac{1}{4}$
- 14 Please to tell the quantity and value of  $3\frac{1}{2}$  pieces of silk, each  $24\frac{1}{2}$  yds. at 6s. 6d.  $\frac{1}{2}$  per yd?  
*Answer* quantity 85  $\frac{1}{2}$  yds. value 25l. 14s. 6d.  $2\frac{1}{2}$ qr.
- 15 If  $\frac{1}{2}$  lb. less by  $\frac{1}{4}$ , cost  $13\frac{1}{2}$ d. what cost  $14$ lb. less by  $\frac{1}{2}$  of 2lb?  
*Answer* 4l. 9s.  $9\frac{3}{4}$ d.
- 16 Bought 120lb. of tea, at 8s. per lb. which being sold for 70l. required the gain per cent?  
*Answer* 37l. 5s. 3d. 3qr.  $\frac{5}{8}$
- 17 What will  $13\frac{1}{2}$ lb. cost, at the rate of  $17\frac{1}{2}$  £. per Cwt?  
*Answer* 2l. 3s.  $\frac{3}{4}$
- 18 If  $\frac{1}{5}$  of a ship be worth 73l. 1s. 3d. what part of her may be purchased for 25cl. 10s.  
*Answer*  $\frac{3}{4}$
- 19 If  $3\frac{1}{2}$  times  $3\frac{1}{2}$ lb cost  $1\frac{1}{2}$  time  $1\frac{1}{2}$ l. what is the value of  $\frac{1}{2}$  of  $\frac{1}{3}$  of  $12\frac{1}{4}$ lb?  
*Answer* 7s. 6d.
- 20 A mercer sold  $4\frac{3}{4}$  pieces of silk, each containing  $22\frac{1}{2}$  yds. at  $8\frac{1}{4}$ s. per yd. what is the amount of his bill?  
*Answer* 46l. 9s.  $11d\frac{1}{2}$
- 21 A person having  $\frac{4}{5}$  of a ship, sells  $\frac{2}{3}$  of his share for 319l. what is the proportional worth of the whole vessel?  
*Answer* 598l. 2s. 6d.

INVERSE PROPORTION.

R U L E.

After the necessary preparations, multiply the first and second terms together, and divide that product by the third term; or,

Invert the dividing term, and multiply them together for the fractional answer. See the last note.

# 130 *The Single Rule of Three in V. Fractions.*

## EXAMPLES.

1 What quantity of shalloon that is  $\frac{3}{4}$  yd. wide will line  $7\frac{1}{2}$  yds. of cloth,  $1\frac{1}{2}$  yd. wide?

*Firſt*,  $7\frac{1}{2} = 1\frac{1}{2}$  yds. } As  $\frac{3}{4}$  yd. ..  $1\frac{1}{2}$  : :  $\frac{3}{4}$  .. 15 *Answer*.  
*Second*,  $1\frac{1}{2} = \frac{3}{2}$  yds. }

Or, cancelled;  $\frac{3}{2} \frac{15}{2} \frac{4}{3} = 15$  yds.

2 If  $3\frac{1}{2}$  yds. of cloth that is  $1\frac{1}{2}$  yd. wide, be ſufficient to make a cloak; how much Perſian which is but  $\frac{4}{5}$  yd. wide will be required to line it? *Answer* 4yd. 3qr. 2na.

3 16 men finishing a piece of work in  $28\frac{1}{3}$  days; the time is required in which 12 men ſhould do it?

*Answer*  $37\frac{2}{3}$  days.

4 In exchanging  $20\frac{1}{2}$  yds. of cloth of  $1\frac{1}{4}$  yd. wide, for ſome of the ſame quality of  $\frac{3}{4}$  yd. wide; what quantity of the latter makes an equal barter? *Answer*  $34\frac{1}{2}$  yds.

5 If 3 men can perform a ſervice in  $4\frac{1}{2}$  hours; in what time may 10 men effect it? *Answer* 1hr. 21min.

6 When wheat is at  $5\frac{1}{2}$ s. per buſhel, if the penny loaf weigh 7oz. what is it per buſhel, when the penny loaf weighs  $2\frac{1}{2}$ oz? *Answer* 15s. 4d. 3qr.  $\frac{2}{3}$

7 If, when the price of wheat is  $6\frac{1}{4}$ s. per buſhel, the penny loaf weighs 9oz. what muſt it weigh, when that grain ſells at  $4\frac{1}{2}$ s. a buſhel? *Answer* 12oz. 8dr.

8 A piece of tapeſtry 3 ells Flemiſh wide; and four long, is to be lined with ſtuff which is but  $\frac{3}{4}$  yd. wide; how many yards are ſufficient? *Answer* 9yds.

9 Suppoſe 275 yds. of cloth, that is  $1\frac{1}{2}$  yd. wide, make coats for 130 men; what number of yards of ſhalloon of  $\frac{3}{4}$  yd. wide will be requiſite to line them?

*Answer* 458 $\frac{1}{2}$  yds.

10 How many yards of baize ell Engliſh wide, will be ſufficient to line 20 yards of camblet, that is  $\frac{3}{4}$  yd. wide?

*Answer* 12 yds.

11 A merchant bartering  $5\frac{8}{9}$  C. of ſugar at  $6\frac{1}{2}$ d. per lb. for tea, at  $8\frac{1}{2}$ s. per lb. would know what quantity of the latter article he is to receive?

*Answer* 43  $\frac{7}{8}$  lb.

12 What



*The Double Rule of Three in V. Fractions.* 131

12 What number of pieces of merchandize at  $20\frac{1}{8}s.$  per piece, are equivalent to  $240\frac{1}{4}$  pieces, at  $12\frac{1}{2}s.$  per piece?

*Answer*  $149\frac{1}{11}\frac{7}{11}$  pieces.

13 A lends to B  $100\frac{3}{4}l.$  for  $6\frac{3}{4}$  months; what sum should B lend A for  $3\frac{5}{8}$  years to requite his kindness?

*Answer*  $14l. 11s. 9d. 1\frac{5}{8}qr.$

14 How many yards of cloth, at  $8\frac{1}{2}s.$  per yard, must be given for  $26\frac{5}{8}$  yards, at  $5\frac{7}{8}s.$  a yard?

*Answer*  $17yds. 1qr. 3na. \frac{3}{4}$

THE DOUBLE RULE OF THREE IN VULGAR FRACTIONS.

RULE,

Prepare the terms, if necessary; then state, and work them agreeably to the directions given in whole numbers. Or,

Invert the dividing terms, and multiply the upper figures continually for the numerator, and those below for the denominator of the fractional answer.

Note. The note to case 5, in reduction, may be applied here.

EXAMPLES.

1 If  $\frac{1}{4}$  yard of cloth that is  $\frac{7}{8}yd.$  wide cost  $\frac{2}{3}l.$  what is the value of  $\frac{5}{8}$  yard, that  $1\frac{3}{4}yd.$  wide being of the same quality?

$$\begin{array}{l} \text{If } \frac{1}{4}yd. \} \frac{2}{3}l. \} \left\{ \frac{5}{8}yd. \right\} \\ \quad \frac{7}{8}yd. \} \left\{ \frac{7}{8}yd. \right\} \\ \frac{1}{4} \times \frac{7}{8} = \frac{7}{32} \} \\ \frac{5}{8} \times \frac{7}{8} \times \frac{2}{3} = \frac{70}{192} \} \quad \frac{70}{192} \div \frac{7}{32} = \frac{234}{192} = \frac{39}{24} = 1\frac{3}{4} = 13s. 4d. \text{ Answer.} \end{array}$$

$$\begin{array}{l} \text{Or} \quad \cancel{4} \times \cancel{8} \times 2 \times \cancel{8} \times \cancel{7} \\ \text{Cancelled.} \quad \frac{3 \times \cancel{7} \times \cancel{8} \times 8 \times \cancel{4}}{\quad} = \frac{2}{3}l. = 13s. 4d. \end{array}$$

2 If 9 students spend  $10\frac{1}{2}l.$  in 18 days; what sum will 20 students spend in 30 days? *Answer*  $39l. 18s. 4d. \frac{2}{3}$

3 The labour of 3 men for  $19\frac{1}{2}$  days came to  $8\frac{1}{6}l.$  at the same rate, what must 20 men have for working 100 days? *Answer*  $305l. 0s. 8d. \frac{1}{2}$

132 *The Double Rule of Three in V. Fractions.*

4 If 5 persons drink  $7\frac{1}{2}$  gallons of beer in a week, what quantity will serve 8 persons  $22\frac{1}{2}$  weeks?

*Answer*  $280\frac{1}{2}$  gallons.

5 Fourteen persons, upon examining into their expences for 20 weeks past, found they had laid out  $40\frac{1}{4}l.$  at the same rate, in what time may  $20l. \frac{3}{4}$  be expended by 46 persons?

*Answer*  $3\frac{1}{4}\frac{1}{11}$  weeks.

6 If  $13\frac{1}{2}l.$  in  $\frac{3}{4}$  of a year, gain  $1\frac{1}{4}l.$  interest, what interest will  $50l.$  gain in  $\frac{5}{12}$  of a year and at what rate per cent. per annum?

*Answer*  $2l. 5s. 1d. 2\frac{2}{3}qr.$  at  $10\frac{5}{8}$  per cent.

7 If  $50l.$  in  $\frac{5}{12}$  of a year gain  $2l. 5s. 1d. 2\frac{2}{3}qr.$  in what time will  $13\frac{1}{2}l.$  gain  $1\frac{1}{4}l.$  and at what rate per cent per annum?

*Answer*  $\frac{3}{4}$  year, at  $10\frac{5}{8}$  per cent.

8 when 12 persons use  $1\frac{1}{8}lb.$  of tea per month; how much should a family of 8 persons provide for  $\frac{1}{2}$  year?

*Answer*  $4\frac{1}{8}lb.$

9 Two brothers at school compute the expence of their boarding, tuition, &c. for  $\frac{3}{4}$  of a year to be  $56\frac{1}{4}l.$  how much will the education of 3 sons for  $5\frac{1}{3}$  years cost their father, at that rate?

*Answer*  $600l.$

## DECIMAL FRACTIONS.

A DECIMAL Fraction is a part, or parts of a unit, denoted by a point prefixed to a figure, or figures thus, .4, .45, .456; the first figure after the point, denotes so many tenths of a unit; the second so many hundredths of a unit, or tenths of one tenth; which are equal to, and read as,  $\frac{4}{10}, \frac{45}{100}, \frac{456}{1000}$ .

A mixt number consists of a whole number and a decimal, thus; 245.789; which is,  $245\frac{789}{1000}$ .

As whole numbers, counting from the right to the left, increase in a ten fold proportion; so decimals, counting towards the right, decrease in the same proportion; which is exemplified in the following

T A B L E.

C. of Millions	X. of Millions	Millions	C. of Thousands	X. of Thousands	Thousands	Hundreds	Tens	Units	Tenth Part	Hundredth Parts	Thousandth Parts	X. Thousandth Parts	C. Thousandth Parts	Millionth Parts	X. Millionth Parts	M. Millionth Parts	
9	8	7	6	5	4	3	2	1	.1	.2	3	4	5	6	7	8	9

te. Ciphers annexed to decimals, neither increase nor decrease their value; thus, .25000, and .25 are equal; but, prefixed, decrease them in fold proportion; thus, .5, .05, .005, all express different decimals.

A D D I T I O N O F D E C I M A L S.

R U L E.

place the numbers according to their value ; viz. units under units, tenths under tenths, &c. and add as in addition of integers ; putting the point in the sum total exactly under the point in the example.

E X A M P L E S.

<i>Yards.</i>	<i>Pounds.</i>
947.621	763.6821
576.71	38.718
2718.94	6.64
619.473	37.86
21.66	3.4782
7.8	7.36
<u>4892.204</u>	

What is the sum of  $450 + 31.47 + 376.004 + 1.08 + 456.16 + .05$  ?

*Answer* 1315.364

If  $2476.8471 + 94.9 + 9.8941 + 867.05 + 84.9 + .007 + 5.1008 + 1.6789$  be added together, what is the sum ?

*Answer* 3815.3779

M

S U B T R A C T I O N

## SUBTRACTION OF DECIMALS.

## R U L E.

Place the number, as in addition, with the least under the greatest; and in the difference, set the point directly under those in the example.

## E X A M P L E S.

<i>Yards.</i>	<i>Gallons.</i>	<i>Miles.</i>	<i>Acres.</i>
576.271	3618.218	24611.1	6827.4681
89.7167	1981.85	9716.701	6018.91
<u>416.5543</u>	<u>          </u>	<u>          </u>	<u>          </u>

1. From 100.17, take 84.476, and what is left?

*Answer* 15.694.

2. What is the difference between the sum of 841.46 + 109.62 + 34.691, and of 478.462 + 37.66 + 378.8?

*Answer* 90.849

## MULTIPLICATION OF DECIMALS.

## R U L E.

Multiply as in integers, and point off as many decimal places in the product, as in both the factors.

Note 1. If decimal places be wanting in the product, supply them with ciphers to the decimal point.

2. Multiplication in decimals may be contracted thus:

Set the units figure of the multiplier, under such place of the multiplicand as is to be the lowest retained in the product; and place all the remaining figures of the multiplier in an inverted order: in multiplying, begin with the figure in the Multiplicand which stands over the multiplying figure, adding the increase which may arise, by carrying one for the first five, and one more for every ten after, and set the products so, that the right hand figures stand under each

## E X A M P L E.



EXAMPLES.

1 Multiply 743.56815 by 52.647

Contracted, and to retain three decimal places.

743.56815	743.56815
52.647	746.25
<hr/>	<hr/>
520497705	37178408
297427260	1487136
446140890	446141
148713630	29742
371784075	5205
<hr/>	<hr/>

*Facit* 39146.63239305

39146.632

2 Multiply 79.347 by 23.15 *Facit* 1836.88305

3 Multiply .63478 by .8264 .524582192

4 Multiply 3.141592 by 52.7438 165.6995001296

5 Multiply .385746 by .00463 .00178600398

6 Multiply .002534 by .03256 .00008250704

7 Multiply 245.378263 by 72.4385, reserving 4 places of decimals in the product, *Facit* 17774.8333

8 Multiply 674.4375 by 27.368, reserving only the integers in the product. *Facit* 18458

9 Multiply 27.14986 by 92.41035, and retain 6 places of decimals in the product. *Facit* 2508.928065

10 Multiply 184.8107 by 13.57493, and retain 3 places of decimals in the product. *Facit* 2508.928

DIVISION OF DECIMALS.

R U L E.

When the dividend has not as many decimal places as the divisor, or will not contain it, annex ciphers to supply the defect; then divide as in integers; and point off in the quotient, as many decimal places as the decimal places of the dividend exceed those in the divisor. Or,

Let

Let the divisor be conceived to stand under the containing left hand figures of the dividend, and the first figure of the quotient will possess the same place of integers or decimals, as that in the dividend which corresponds to the units place of the divisor.

When there are many figures in the divisor, the operation may be contracted, thus;

Find what place of integers, or decimals, the first figure of the quotient will possess; and consider how many quotient figures will serve the present purpose; then take the same number of the left hand of the divisor, and as many of the dividend as will contain them (less than ten times) rejecting the rest; then, instead of bringing figures down from the dividend, separate one from the right of the divisor, as often as necessary, till the whole be exhausted; remembering to carry from the right-hand figures of the divisor as in contracted multiplication.

When there are not so many figures in the divisor, divide as usual, till there be as many of the quotient figures found as the divisor is short of the intended quotient; then use the contraction.

### EXAMPLES.

- 1 Divide 2508.92806 by 92.41035  
 92.41035)2508.92806(27.1498 + *Facit.*  
 18482070

---

66072106  
 64687245

---

13848610  
 9241035

---

46075750  
 36964140

---

91116100  
 83169315

---

79467850  
 73928280

---

5539570

*Contracted,*



Contracted so as to have three decimal places in the quotient

$$92.4103,5)2508.92806(27.44 + \text{Facit}$$

$$1848207$$

$$660721$$

$$646872$$

$$13849$$

$$9241$$

$$4608$$

$$3696$$

$$912$$

$$832$$

$$80$$

$$2 \text{ Divide } 1836.88305 \text{ by } 23.15 \quad \text{Facit } 79.347$$

$$3 \text{ Divide } 3673.7661 \text{ by } 158.694 \quad 23.15$$

$$4 \text{ Divide } 234.70525 \text{ by } 64.25 \quad 3.653$$

$$5 \text{ Divide } 9. \text{ by } .9 \quad 10.$$

$$6 \text{ Divide } .9 \text{ by } 9. \quad .1$$

$$7 \text{ Divide } .3 \text{ by } 3. \quad .1$$

$$8 \text{ Divide } .00178600398 \text{ by } .00463 \quad .385746$$

$$9 \text{ Divide } 2508.928065051 \text{ by } 92.41035, \text{ so as to have } 4 \text{ places of decimals in the quotient.} \quad \text{Facit } 27.1498$$

$$10 \text{ Divide } .00357200796 \text{ by } .771492 \quad \text{Facit } .00463$$

$$11 \text{ Divide } 87.076326 \text{ by } 9.365407, \text{ and let there be } 7 \text{ places of decimals in the quotient.} \quad \text{Facit } 9.2976552$$

$$12 \text{ Divide } 174.152652 \text{ by } 18.730814, \text{ and let there be } 3 \text{ places of decimals in the quotient.} \quad \text{Facit } 9.297$$

## REDUCTION OF DECIMALS.

### CASE 1.

To reduce a vulgar fraction to a decimal;

### RULE.

Annex as many ciphers to the numerator as may be necessary, which divide by the denominator,

M 2

See

Note. The quotient must consist of as many decimal places, as there are ciphers annexed.

If a compound fraction be given, reduce it first to a single one.

## E X A M P L E S.

- 1 Reduce  $\frac{1}{4}$  to a decimal.

$$\begin{array}{r} 4 \overline{) 1.00} \\ \hline \end{array}$$

*Facit* .25

- 2 Reduce  $\frac{1}{2}$  to a decimal.

*Facit* .5

- 3 Reduce  $\frac{3}{7}$  to a decimal.

.75

- 4 Reduce  $\frac{5}{8}$  to a Decimal.

.1923+

- 5 Reduce  $\frac{6}{7}$  to a Decimal.

.45614+

- 6 Reduce  $\frac{1}{2}$  of  $\frac{5}{7}$  to a decimal.

.6043956+

- 7 Reduce  $\frac{5}{8}$  of  $\frac{5}{7}$  of  $\frac{7}{8}$  to a decimal..

.07766+

- 8 What is the equivalent decimal for  $\frac{3}{8}$ ?

*Answer* .375

- 9 What is the decimal of  $\frac{1}{25}$ ?

.04

- 10 What are the equivalent decimals for  $\frac{1}{20}$ ,  $\frac{5}{80}$ ,  $\frac{3}{40}$ ,  $\frac{7}{80}$  and  $\frac{1}{25}$ ?

*Answer* .55, .95, .375, .875, .0546875

## C A S E. 2.

To Reduce any sum, or quantity, to the decimal of a given denomination;

## R U L E.

*First*, Divide the given sum, &c. in its lowest mentioned denomination, by the number of like parts in the proposed integer; the quotient will be the decimal required. O,

*Secondly*, Write the given numbers orderly from the least to the greatest in a perpendicular column, and divide each of them by such a number as will reduce it to the next name, annexing the quotient to the succeeding number; the last quotient will be the required decimal.

## EXAMPLES.

1 Reduce 15s. 8d.  $\frac{1}{2}$  to the decimal of a pound; also:  
3qr. 12lb. 6oz. 14.592dr. to that of an C.wt.

$$\begin{array}{r} s. \quad d. \quad qrs. \\ 15 \quad 8\frac{1}{2} = 754 \quad \left. \begin{array}{l} 960 \\ 672 \end{array} \right\} 754.00 \quad (.7854166 \text{ } \text{£}.) + \text{Facit.} \\ 20 \quad 0 = 960 \quad \left. \begin{array}{l} 960 \\ 672 \end{array} \right\} \end{array}$$

8200, &c.

$$\begin{array}{r|l} \text{Or,} & \\ 4 & 2. \text{ gr.} \\ 12 & 8.5d. \\ 2,0 & 15 \quad 708333s. \\ \hline & .7854166+ \end{array} \quad \begin{array}{l} 16 \left\{ \begin{array}{l} 4 \\ 4 \\ 4 \end{array} \right. \begin{array}{l} 14.592 \text{ dr.} \\ (3.648 \\ 6.912 \text{ oz.} \\ (1.728 \\ 12.432 \text{ lb.} \\ (3.108 \\ 4 \quad 3.444 \text{ gr.} \end{array}$$

Facit .861 C.wt.

2 Reduce 7s. 6d. to the decimal of a pound. Facit .375

3 Reduce 9d. to the decimal of a pound. .0375

4 Reduce 10s. 9d.  $\frac{1}{4}$  to the decimal of a pound.  
Facit .5385416+

5 Reduce 24 grains to the decimal of a lb.  
Facit .0041666+

6 Reduce 14 drams to the decimal of a lb. avoirdupois.  
Facit .0546875

7 Reduce 4C. 2qr. to the decimal of a ton. Facit .225

8 Reduce 76 yards to the decimal of a mile.  
Facit .04318+

9 Reduce 3qr. 2na. to the decimal of a yard.  
Facit .875

10 Reduce 4 perches to the decimal of an acre.  
Facit .025

11 Reduce 1 pint to the decimal of a gallon. .125

12 Reduce 7 minutes to the decimal of a day.  
Facit .00480+

13 Reduce 3C.wt. 2qr. 14'b. to C.wt. 3.625 C.wt.

14 Reduce 7yds. 2qr. 3na. to yards. 7.6875yds.

15 Reduce 13 A. 1R 14P. to acres. 13.3375A.

16 Reduce 3mo, 1w. 5da. to months. 3.42857+mo.

C A S E 3.

## C A S E 3.

To reduce a decimal fraction to its value;

## R U L E.

Multiply it by the known parts of the integer.

Note. To find the value of any decimal of a £. by inspection; double the first figure after the point for shillings, adding one, if the second be 5 or upwards; the second, if less than 5, or its excess above 5, call tens, and the third units of farthings, abating one when above 12, and two if above 36.

1 What is the value of .7854166 of a pound?

.7854166 By inspection.  
20 .7854166

s. 15.7083320  
12

s. 15 8 2

d. 8.499984  
4

That is  $7+7+1=15s.$   
and  $35-1=34qrs.=8d.\frac{1}{2}$  } =  $s. d.$   
15 8  $\frac{1}{2}$

qr. 1.999936 Answer s. d. qrs.  
15 8 1.9999

2 What is the value of .76 of a pound?

Answer 15s. 2d. 1.6qr.

3 What is the value of .625 of a shilling? Answer 7d.  $\frac{1}{2}$ 

4 What is the value of .8322916 of a £.

Answer 16s. 7d.  $\frac{1}{2}$ 

5 What is the value of .861 of an C. wt?

Answer 3qr. 12lb. 6oz. 14.592dr.

6 What is the value of .7 of a lb. troy?

Answer 8oz 8dwt.

7 What is the value of .761 of a day?

Answer 18hr. 15min. 50.4sec.

8 What is the value of .71 of 40z. troy?

Answer 20z 16dwt. 19.2gr.

9 What is the value of .67 of a league?

Answer 2M. 3pls. 1yd. 3in. 1.8b.c.

10 What is the value of .4712 of an ell English?

Answer 2qr. 1.424na.

11 What



- 11 What is the value of .092 of 3*A*. 2*R*?  
*Answer* 1*R*. 11.52*per*.
- 12 What is the value of .3 of a year?  
*Answer* 109*da*. 13*hr*. 48*min*.
- 13 What is the value of .6875 of a yard?  
*Answer* 2*qr*. 3*na*.
- 14 What is the value of .3375 of an acre?  
*Answer* 1*R*. 14*per*.
- 15 Find the value of .785 of a £. by inspection.  
*Answer* 15*s*. 8*d*.  $\frac{5}{8}$
- 16 Find the value of .875 of a £. by inspection.  
*Answer* 17*s*. 6*d*.
- 17 What is the value of a tenement for 9 years, at 12.4*l*. *per annum*?  
*Answer* 111*l*. 12*s*.
- 18 Sold 25 yards of superfine scarlet cloth, at 2.75*l*. *per yard*; what was its value?  
*Answer* 68*l*. 15*s*.
- 19 What is the sum of .48 of a £. and .16 of a shilling?  
*Answer* 9*s*. 9.12*d*.
- 20 What is the sum of .17 of a *lb*. troy, and 84 of an *oz*?  
*Answer* 20*z*. 17*dwt*. 14.4*gr*.
- 21 What is the sum of .17*T*. .19*C wt*. .17*qr*. .7*lb*?  
*Answer* 3*C wt*. 2*qr*. 15.54*lb*.
- 22 What is the sum of .78 acres, and .67 rood?  
*Answer* 3*R*. 31.6*per*.
- 23 What is the difference between .17*l*. and 7*s*?  
*Answer* 2*s*. 8*d*. 1.6*qr*.
- 24 What is the difference between .41 days, and .16 of an hour?  
*Answer* 9*hr*. 40*min*. 48*sec*.

## THE SINGLE RULE OF THREE IN DECIMALS.

The operations both in direct and inverse proportions are agreeable to those rules in page 57, and 62, having regard to placing the points.

## DIRECT PROPORTION.

## EXAMPLES.

If 1.4*lb*. of mace cost 14.5*s*. what cost 75.31*lb*?  
*lb.*    *s.*    *lb.*    *£.*    *s.*    *d.*    *qr.*  
*As* 1.4 .. 145 :: 75.31 .. 38 19 11 3.52 *Answer.*  
2 15

142 *The Single Rule of Three in Decimals.*

2 If 1.6*C.* of sugar sell for 3*l.* 12 76*s.* what is the proportional cost of 3*bbds.* each 11*C.* 3*qr.* 10.12*lb*?

*Answer* 8*ol.* 15*s.* 3*d.* 3.36*qr.*

3 If 1.5*oz.* of silver be worth 7.8*s.* what is the value of 9.7*lb*?

*Answer* 30*l.* 5*s.* 3*d.* 1.44*qr.*

4 If 1.47*C.*wt. of sugar be worth 4.5*l.* what is that for 1.7*lb*?

*Answer* 11.1*d.*

5 Sold 12.5*bbds.* of wine, at 1.2*s.* per pint; query the amount?

*Answer* 378*l.*

6 Bought 3 pieces of cloth, each 21.5 yards, at 12.3*s.* per *yd.* please to cast up the cost.

*Facit* 39*l.* 13*s.* 4.2*d.*

7 If 8.4*lb.* of tobacco cost 16*s.* 4.6*d.* what is the value of 3*bbds.* each 4*C.* 2*qr.* 7.4*lb*?

*Answer* 149*l.* 12*s.* 3*d.* 2

8 How many yards are in a piece of cloth which brings 6*l.* 13.12*s.* at 4*s.* 2.6*d.* per *yd*?

*Answer* 31.569*yds.*

9 Bought 5.8 tons of oil for 60.4*l.* whereof 50.9*gal.* leaked out; what must the rest be sold for per gallon, that the purchaser may be no loser?

*Answer* 10.27*d.*

10 A grocer bought 7.6*C.*wt. of sugar, at 40.1*s.* per *C.*wt. which he sold out at 4.5*d.* per *lb.* whether did he gain or lose, and how much?

*Answer* gained 14*s.* 5*d.* 1.12*qr.*

11 Bought 3*C.* 1.5*qr.* of cloves, at 2.75*s.* per *lb.* which was sold for 8*ol.* 11*s.* 6*d.* query the gain?

*Answer* 8*l.* 12*s.*

12 When a merchant buys 436 yards of cloth at 8.5*s.* per *yd.* what will he gain by disposing of it at 10.75*s.* per yard?

*Answer* 49*l.* 1*s.*

13 A owes B 296.85*l.* but compounds for 7.5*s.* in the *£.* what sum must B receive?

*Answer* 111*l.* 6*s.* 4*d.* 2*qr.*

14 How many English ells of Holland may be bought for 25*l.* 18*s.* 1*d.* 2/3, at 7*s.* 9*d.* 2/3 per *yd*?

*Answer* 53*E.* 1*qr.*

15 If a yard of ribband sell for 4.5 cents, how many dollars will buy 345 yards?

*Answer* 15.525, *i. e.* 15*D.* 52 1/2*c.*

*D. d. c. m.*

16 When 675 yards cost 12.8 2 5, how many yards may be had for 38 mills?

*Answer* 2 yards.

*D. d. c.*

17 If 19 yards of calico bring 25.7 5; what will 435.5 yards come to?

*D. d. c. m.*

*Answer* 590.2 1 7 1/8

18 What



*The Single Rule of Three in Decimals.* 143

18 What must be paid for  $7\frac{1}{8}$  yds. of broad cloth, at  $5\frac{1}{2}$  dollar per yd? *Answer* 40.5625 D. or 40 D. 56 $\frac{1}{2}$  cents.

19 How does broad cloth sell per yd when  $7\frac{1}{8}$  yds. cost 40 D. 56 $\frac{1}{2}$  cents? *Answer* 5.5 D.

20 The French foot is just 1.068 ft. English; how tall then would a 6 ft. Philadelphian be at Paris?

*Answer* but 5.618 ft.

INVERSE PROPORTION.

EXAMPLES.

1 How many men can do as much work in  $\frac{1}{4}$  of a month, as 16 men could in a month and a half?

mo. men. mo. men.

As 1.5 .. 16 ::  $\frac{1}{4}$  .. 60 *Answer.*

2 If, when wheat flour is as high as 6 l. per C.wt. the half-penny cake weighs 1.1333 oz. what should be the weight of it, when flour is only 1.8125 l. per C.wt.

oz. oz. dr.

*Answer* 3.75 = 3 12

3 If a board be .75 foot broad, what length will it require to measure 12 square feet?

*Answer* 16 ft.

4 How much Persian .75 yd. wide, will line 25.5 yds. of five quarter cloth?

*Answer* 42.5 yds.

5 A had 40.7 yds. of linen for which B gave him 25.6 ells of Holland, valued at 4.5 s. per ell; how was A's linen rated per yd?

*Answer* 2s. 9d. 3.8 gr.

6 How many dollars of 7.5 s. each should be given in exchange for 100 French guineas, at 34. 5 s?

*Answer* 460.

7 What sum has A at interest, when it yields as much in  $7\frac{1}{2}$  months, as B's 450 l. do in 15?

*Answer* 900 l.

THE DOUBLE RULE OF THREE IN DECIMALS.

Questions in this rule are wrought as in whole numbers, placing the points agreeably to the preceding directions.

EXAMPLES.

1 If 3 men receive 8.9 l. for 19.5 days labour; how much must 20 men have for 100.25 days?

144 *The Double Rule of Three in Decimals.*

If  $3M \left\{ \begin{array}{l} 8.9l. \\ 19.5da. \end{array} \right\} \left\{ \begin{array}{l} 29M \\ 100.25da. \end{array} \right\}$  Answer £. 305 0 8.2

2 If 2 persons receive 4.625s. for 1 day's labour, how much should 4 persons have for the work of 10.5 days?

Answer 4l. 17s. 1d.  $\frac{1}{2}$

3 If 16s. 4d. be the portage of 5.25 Cwt. for 20 miles; what must be paid for carrying 17.75 Cwt. 7.5 miles?

Answer 1l. 0s. 8d.  $\frac{1}{2}$

4 How many men should reap 417.6 acres in 12 days, when 5 persons cut down  $\frac{1}{5}$  of that quantity in half the time?

Answer 20 men.

5 Suppose the interest of 76.94l for 9.5 months to be 15.25l. what principal will gain 6l in 12.75 months?

Answer 22l. 11s. 1d.  $\frac{1}{2}$

6 When 12 oxen graze down 16.25 acres; in 20 days; how much of like pasture, would suffice 24 such cattle for 100 days?

Answer 162.5 acres.

7 What money at  $3\frac{1}{2}$  per cent, per annum, will clear 38l. 10s. in a year and a quarter?

Answer 880l.

8 A cellar which is 22.5ft. long, 17.3 wide and 10.25 deep, being dug in  $2\frac{1}{2}$  days, by 6 men, working 12.3 hours a day; how many days, of 8.2 hours, should 9 men take to excavate one which measures 45. by 34.6 by 12.3 feet?

Answer 12 days.

## INVOLUTION; OR THE RAISING OF POWERS.

**A** POWER is the product arising from multiplying any given number into itself continually a certain number of times; thus,

$2 \times 2 = 4$  is the second power, or square of 2.

$2 \times 2 \times 2 = 8$  the third power, or cube of 2.

$2 \times 2 \times 2 \times 2 = 16$  the fourth power of 2, &c.

The number denoting the power is called the index, or the exponent of that power.

If two or more powers are multiplied together, their product is that power whose index is the sum of the exponents of the factors; thus,

$2 \times 2 = 4$  the square of 2;  $4 \times 4 = 16 = 4^{\text{th}}$  power of 2;  
and  $16 \times 16 = 256 = 8^{\text{th}}$  power of 2, &c.

TABLE

TABLE of the first nine Powers.

Roots	Squares	Cubes	4th power	5th power	6th power	7th power	8th power	9th power
1	1	1	1	1	1	1	1	1
2	4	8	16	32	64	128	256	512
3	9	27	81	243	729	2187	6561	19683
4	16	64	256	1024	4096	16384	65536	262144
5	25	125	625	3125	15625	78125	390625	1953125
6	36	216	1296	7776	46656	279936	1679616	10077696
7	49	343	2401	16807	117649	823543	5764801	40353607
8	64	512	4096	32768	262144	2097152	16777216	134217728
9	81	729	6561	59049	531441	4782969	43046721	387420489

## EXAMPLES.

- What is the fifth power of 7?  
 $7 \times 7 \times 7 \times 7 \times 7 = 16807 = \text{fifth power.}$
- What is the third power or cube of 35?  
*Answer* 42875.
- What is the fourth power of  $\frac{1}{2}$ ?  
 $\frac{1}{16}$
- What is the fifth power of .029? .00000020511149.
- What is the sixth power of 5.03?  
*Answer* 16196.005304479729.
- What is the eighth power of  $3\frac{2}{3}$ ?  $17857\frac{306816}{3276825}$ .

## EVOLUTION: OR THE EXTRACTING OF ROOTS.

THE root of any number, or power, is such a number, as, being multiplied into itself a certain number of times, will produce that power. Thus 2 is the square-root of 4, because  $2 \times 2 = 4$ ; and 4 is the cube root of 64, because  $4 \times 4 \times 4 = 64$ , and so on.



## THE SQUARE-ROOT.

**T**HE square of a number is the product arising from that number multiplied into itself.

Extraction of the square root is the finding of such a number, as, being multiplied by itself, will produce the number proposed.

## R U L E.

1 Distinguish the given number into periods of two figures each, beginning at the units place, or decimal point; and when the decimal does not consist of an even number of figures, annex a cipher; and equal to the periods of whole numbers and decimals respectively, will be the places of each in the root.

2. Deduct from the first period the greatest square it contains, setting the root thereof as a quotient figure, and doubling it for a divisor; and bring down the second period to the remainder, for a dividend.

3. Try how often the said divisor, with the resulting figure of this trial, thereto annexed, are contained in the dividend, and set this resulting figure to both divisor and root; then multiply and subtract as in division, and bring down the next period.

4. Double the ascertained root for a new divisor, and repeat the process to the end.

## P R O O F.

Square the root, adding in the remainder (if any) which will equal the number given.

## E X A M P L E S.

1 What is the square root of 30138.696025?

$$\begin{array}{r}
 \overset{'}{3}\overset{'\prime}{0}\overset{'\prime\prime}{1}\overset{'\prime\prime\prime}{3}\overset{'\prime\prime\prime\prime}{8}.\overset{'\prime\prime\prime\prime\prime}{6}\overset{'\prime\prime\prime\prime\prime\prime}{9}\overset{'\prime\prime\prime\prime\prime\prime\prime}{6}\overset{'\prime\prime\prime\prime\prime\prime\prime\prime}{0}\overset{'\prime\prime\prime\prime\prime\prime\prime\prime\prime}{2}\overset{'\prime\prime\prime\prime\prime\prime\prime\prime\prime\prime}{5} \\
 30138.696025 \text{ (173.605 Answer.} \\
 \hline
 1 \\
 27 \overline{) 201} \\
 \underline{189} \\
 343 \overline{) 1238} \\
 \underline{1029} \\
 3466 \overline{) 20969} \\
 \underline{20996} \\
 347205 \overline{) 1736025} \\
 \underline{1736025} \\
 0000
 \end{array}$$

Note.

## The Square-Root.

147

Note. When one more than half the figures of the root are found, the rest may be obtained by working as in contracted division of decimals.

2. Required the square-root of 14876.2357?

$$\begin{array}{r}
 14876.2357(121.968175 \\
 \underline{1} \\
 22)48 \\
 \underline{44} \\
 241)476 \\
 \underline{241} \\
 2429)23523 \\
 \underline{21861} \\
 24386)166257 \\
 \underline{146316} \\
 24392)19941(8175 \\
 \underline{427} \\
 \underline{183} \\
 \underline{13} \\
 1
 \end{array}$$

- 3 Required the square-root of 5499025? *Facit* 2345  
 4 What is the square-root of 74770609? *Answer* 8647  
 5 What is the square-root of 368863? 607.34092+  
 6 What is the square-root of 3271.4007? 57.19+  
 7 What is the square-root of 2.2710957? 1.50701+  
 8 What is the square-root of 10? 3.162277+  
 9 What is the square-root of .0003272481? .01809  
 10 Required the side of a square acre of land?

*Facit* 12.649+per.

11 A certain number of men gave 30s. 1d for a charitable purpose; each man giving as many pence as there were men: query their number?

*Answer* 19 men.

12 If a circular pipe of 1.5 inches diameter, fill a cistern in 5 hours; in what time would it be filled by one of 3.5 inches diameter?

*Answer* 55 min. 6sec.

13 11

13 If 484 trees be planted in a square orchard, how many must be in a row each way? *Answer 22*

Note 1. The square of the longest side of a right angled triangle, is equal to the sum of the squares of the other two sides: and consequently the difference of the square of the longest, and either of the other, is the square of the remaining side.

2 The square root of a vulgar fraction is found by reducing it to its lowest terms, and extracting the root of the numerator, for a numerator, and of the denominator for a denominator. If it be a surd, reduce it to its equivalent decimal, &c.

3 A mixt number may be reduced to an improper fraction, or a decimal, and the root thereof extracted as before.

14 The wall of a fortress is 17 feet high, which is surrounded by a moat 20 feet in breadth; query the length of a ladder to reach from the out side of the moat to the top of the wall? *Answer 26.2 feet.*

15 A line of 36 yards long will exactly reach from the top of a fort to the opposite bank of a river, known to be 24 yards broad; the height of the wall is required;

*Answer 26.83 + yds.*

16 Suppose a ladder 60 feet long be so planted as to reach a window 37 feet from the ground on one side of the street, and without moving it at the foot, will reach a window 23 feet high on the other side; what breadth was the street of? *Answer 102.64 feet.*

17 What is the square-root of  $\frac{1024}{625}$ ?

*Answer  $\frac{32}{25}$*

18 What is the square-root of  $\frac{7056}{625}$ ?

*$\frac{84}{25}$*

19 What is the square-root of  $\frac{3108}{625}$ ?

*.71528*

20 What is the square-root of  $37\frac{1}{4}$ ?

*6 $\frac{1}{2}$*

21 What is the square-root of  $17\frac{1}{4}$ ?

*4 $\frac{1}{2}$*

22 What is the square-root of  $76\frac{1}{4}$ ?

*8.7649+*

## THE CUBE-ROOT.

THE cube of a number is the product of that number multiplied into its square.

Extraction of the cube-root is the finding of such a number, as, being multiplied into its square, will produce the number proposed.

### R U L E.

*First*, Distinguish the proposed number into periods of three figures each, beginning at the units place, or decima

*ye*



point; and when the decimal does not consist of a complete period or periods, annex a cipher or ciphers to make it so; and the places of the root will be as many as the periods of the given ~~cube~~ in whole numbers and decimals respectively.

*Secondly*, Find the greatest root of the left hand period, which place to the right of the given number, and subtract the cube thereof from said period; and to the remainder bring down the next period for a dividual.

*Thirdly*, Take the triple square of the ascertained root for a defective divisor.

*Fourthly*, Reserve mentally the units and tens of the dividual, and try how often the defective divisor is contained in the rest; place the result of this trial to the root, and its square to the right of said divisor, supplying the place of tens with a cipher, if the square be less than 10.

*Fifthly*, Complete the divisor, by adding thereto the product of the last figure of the root by the rest, and by 30.

*Sixthly*, Multiply, subtract, and bring down the next period for a dividual, for which find a divisor as before; and so proceed with every period.

Note. Defective divisors, after the first, may be more concisely found by addition, thus: To the last complete divisor, add the number which completed it, with twice the square of the last figure in the root; the sum will be the next defective divisor.

# E X A M P L E S.

1. What is the cube root of 444194.947?

$$\begin{array}{r} 444194.947(76.3 \text{ Ans.} \\ 343 \end{array}$$

$$\begin{array}{l} \{ \text{Defec. div. and sqr. of } 6 = 14736 \} 101194 \\ \{ + 1260 = \text{complete divisor } 15996 \} 95976 \end{array}$$

$$\begin{array}{l} \{ \text{Defec. div. and sqr. of } 3 = 1732809 \} 5218947 \\ \{ + 6840 = \text{complete divisor } 1739649 \} 5218947 \end{array}$$

0

2. What

N 2:

- 2 What is the cube-root of  $34328125$ ? *Answer* 325  
 3 What is the cube-root of  $84604519$ ? 439  
 4 What is the cube-root of  $259694072$ ? 638  
 5 What is the cube-root of  $22069810125$ ? 2805  
 6 What is the cube-root of  $673373097125$ ? 8765  
 7 What is the cube-root of  $12977875$ ? 235  
 8 What is the cube-root of  $.001906624$ ? .124  
 9 What is the cube-root of  $15926.972504$ ? 25.16+  
 10 What is the cube-root of  $171.46776406$ ? 5.555+  
 11 What is the difference between half a solid foot, and a solid half foot? *Answer* 3 half feet.  
 12 In a cubical foot, how many cubes of 6 inches, and how many of three are contained therein?

*Answer* 8 of 6in. and 64 of 3in.

- 13 The content of an oblong cellar is 1953.125 cubic feet; required the side of a cubical cellar that shall contain just as much? *Answer* 12.5 feet.

- 14 A stone of a cubic form contains 474552 solid inches; what is the superficial content of one of its sides?

*Answer* 6084 inches.

- 15 A merchant laid out 691l. 4s. in cloths, but forgot the number of pieces purchased, also how many yards were in each piece, and what they cost him per yard; but remembers, that they cost him as many shillings per yard as there were yards in each piece, and that there were just as many pieces; query the number purchased? *Answer* 24

*Note* 1. The cube-root of a vulgar fraction is found by reducing it to its lowest terms, and extracting the root of the numerator for a numerator, and of the denominator for a denominator. If it be a surd, extract the root of its equivalent decimal.

2. A mixt number may be reduced to an improper fraction, or a decimal, and the root thereof extracted.

- 16 What is the cube-root of  $1\frac{3}{8}$ ? *Answer*  $1\frac{1}{2}$   
 17 What is the cube-root of  $1\frac{64}{27}$ ?  $1\frac{4}{3}$   
 18 What is the cube-root of  $\frac{4}{27}$ ? .763  
 19 What is the cube-root of  $\frac{6}{7}$ ? .949+  
 20 What is the cube-root of  $13\frac{2}{3}$ ? 2.3908+  
 21 What is the cube-root of  $42\frac{1}{2}$ ? 3 $\frac{1}{2}$   
 22 What is the cube-root of  $5\frac{104}{125}$ ? 8 $\frac{1}{5}$   
 23 What is the cube-root of  $405\frac{28}{125}$ ? 7 $\frac{2}{5}$   
 24 What is the cube-root of  $7\frac{1}{2}$ ? 1.966+  
 25 What is the cube-root of  $9\frac{1}{2}$ ? 2.092+

GENERAL.

# GENERAL RULE FOR EXTRACTING THE ROOTS OF ALL POWERS.

**F**IRST, If the index of the power be even, extract the square-root of the given number; whereby it will be depressed to a power half as high; or, if the index will divide by 3 without remainder, take the cube-root for a power  $\frac{1}{3}$  as high; thus proceed till the required root be obtained, or an odd power result, the index of which will not divide evenly by 3.

II. The root of such an odd power may be extracted thus;

*First*, Beginning at units, point the given number into periods of as many figures each as are expressed by its index.

*Secondly*, Find such a figure or figures, by the table of powers or by trial, as will be nearest the first of the root, whether greater or less.

*Thirdly*, Involve the part of the root so found to the power, and take the difference between this power and as many periods of the given number as there are figures obtained of the root, and multiply this difference by the said figures for a dividend.

*Fourthly*, Multiply the sum of the said periods and power by the integral half of the index (*i. e.* for a 5th power, by 2, a 7th by 3, &c.) and to the product add the said power for a divisor.

*Fifthly*, Apply the quotient, as a correction to the part of the root before found, by addition or subtraction, accordingly as that part is less or more than just.

*Sixthly*, Repeat the operation if greater accuracy, or more figures in the root be desired; using the root so corrected instead of the figure or figures first found, &c.

## EXAMPLES.

1. What is the 5th root of 1,2461819?

$$\begin{array}{r}
 1.24618 \\
 \underline{1.00000} \quad , \quad , \\
 2.24618 \quad 1.2461819(1.0 \\
 \underline{2} \quad 1.00000 \quad .045 \\
 4.49236 \quad .24618 \quad 1.045 \text{ Root.} \\
 \underline{1.00000} \quad 1.0 \\
 \text{Divi. } 5.49236 \quad .246180(.045 \\
 \quad \quad \quad 2197 \\
 \quad \quad \quad \underline{265} \\
 \quad \quad \quad 275
 \end{array}$$

- 2 What is the cube-root of  $\frac{1}{2}$ ? *Answer* .7937005  
 3 What is the fourth root of 97.41? 3.1415999  
 4 What is the sixth root of 21035.8? 5.254037  
 5 What is the seventh root of 34487717467307513182  
 492153794673? *Answer* 32017  
 6 What is the eighth root of 112101628132047623624  
 6497942460481? *Answer* 13527  
 7 What is the ninth root of 9763796029890739602796  
 30298890? *Answer* 2148.7201  
 8 What is the 365th root of 1.05? *Answer* 1.0001336

## ARITHMETICAL PROGRESSION.

**A**RITHMETICAL Progression is a rank, or series of numbers, which increase or decrease by a common difference; in which five particulars are to be observed, viz.

- First*, The first term;  
*Secondly*, The common excess or difference;  
*Thirdly*, The last term;  
*Fourthly*, The number of terms;  
*Fifthly*, The sum of all the terms.

*Note.* In any series of numbers in arithmetical progression, the sum of the two extremes will be equal to the sum of any two terms equally distant therefrom; as 2, 4, 6, 8, 10, 12; where  $2+12=14$ ; so  $4+10=14$ ; and  $6+8=14$ ; or 3, 6, 9, 12, 15; where  $3+15=18$ ; also  $6+12=18$ ; and  $9+9=18$ .

## C A S E 1.

The first term, common difference, and number of terms given, to find the last term, and sum of all the terms;

## R U L E.

*First*, Multiply the number of terms, less 1, by the common difference, and to that product add the first term, the sum is the last term

*Secondly*, Multiply the sum of the two extremes by the number of terms, and half the product will be the sum of the series.

## EXAMPLES.



EXAMPLES.

1 Bought 19yds. of shalloon, at 1*d.* for the first yd. 3*d.* for the second, 5*d.* for the third, &c. increasing 2*d.* every yd. what did they amount to?

$$19-1=18$$

$$1+37=38$$

$$\begin{array}{r} 2 \\ \hline 36 \\ + 1 \\ \hline \end{array}$$

$$\begin{array}{r} 19 \text{ number of terms.} \\ \hline 342 \\ 38 \\ \hline \end{array}$$

$$\begin{array}{r} \text{The last term } 37 \\ \hline \end{array}$$

$$\begin{array}{r} 2)722 \\ \hline \end{array}$$

$$\begin{array}{r} 12)361 \text{ sum of the terms,} \\ 2,0)3,0 \quad 1 \\ \hline \end{array}$$

£.1 10 1 Answer

2 Sixteen persons bestowed charity to a poor man; the first gave 5*d.* the second 9*d.* and so on in arithmetical progression; what did the last person give, and what sum did the indigent person receive?

Answer the last gave 5*s.* 5*d.* sum received 2*l.* 6*s.* 8*d.*

3 A merchant sold 100yds. of cloth; for the first yard he received 1*s.* for the second 2*s.* for the third 3*s.* &c. what sum did he receive?

Answer 252*l.* 10*s.*

4 Admit 100 stones were laid two yards distant from each other in a right line, and a basket placed 2 yards from the first stone; what distance must a person travel, to gather them singly into the basket?

Answer 11*M.* 3*fur.* 180yds.

5 Sold 54yds. of cloth; the price of the first yard was 2*s.* of the second 5*s.* &c. what was the price of the last yard, and sum for all?

Answer { the last yd. 8*l.* 1*s.*  
whole sum 220. 1*s.*

6 H covenanted with K to serve him 14 years, and to have 5*l.* the first year, and his wages to encrease annually 2*l.* during the term; what had he the last year, what on an average yearly, and what for the whole time?

Answer { 31*l.* the last year.  
18*l.* annually.  
252*l.* whole time.

## C A S E 2.

When the two extremes and number of terms are given, and the common difference of all the terms required ;

## R U L E.

Divide the difference of the extremes by the number of terms, less one, the quotient will be the common difference.

## E X A M P L E S.

1 Admit a debt be discharged at 16 several payments in arithmetical progression ; the first to be 14*l*. the last 100*l*. what is the common difference, and what each payment, and the whole debt ?

$$\begin{array}{rcl}
 100 - 14 & \begin{array}{l} \text{£. s. d.} \\ 5 \quad 14 \quad 8 \end{array} & \text{common difference.} \\
 \hline
 16 - 1 & 14 \quad 0 \quad 0 & \text{the first payment.} \\
 & \hline
 & 19 \quad 14 & \text{8=second.} \\
 & \hline
 & 25 \quad 9 \quad 4 & \text{third, \&c.} \\
 & \hline
 \end{array}$$

$$14 + 100 \times 8 = 912 \text{ l. the whole debt}$$

2 A man had 10 sons, whose several ages differed alike ; the youngest was 3 years old, and the eldest 48 ; what was the common difference of their ages ? *Answer* 5 years.

3 There are 21 persons, whose ages are equally distant from each other ; the youngest is 20 years old, and the eldest 60 ; what is the common difference of their ages, and the age of each person ? *Answer* Common difference 2 years.

20 the age of the first person.

$$20 + 2 = 22 \quad \text{of the second.}$$

$$22 + 2 = 24 \quad \text{of the third. \&c.}$$

4 A footman is to travel from Philadelphia to a certain place in 19 days, and to go but six miles the first day, increasing every day by an equal excess, so that the last day's journey may be 60 miles ; what is the common difference, and distance of the journey ?

$$\text{Answer } \left\{ \begin{array}{l} \text{Common difference } 3 \\ \text{Distance } 627 \end{array} \right\} \text{ miles.}$$

GEOMETRICAL



# GEOMETRICAL PROGRESSION.

GEOMETRICAL Progression is a series of numbers, increasing or decreasing by one continual multiplier divisor, called the ratio; as 2, 4, 8, 16, 32, &c. increase by the continual multiplication of 2; and 32, 16, 8, 4, 2, decrease continually by the divisor 2, &c. The last term and sum of the series are found by this

## R U L E.

Multiply the first term into such a power of the ratio as indicated by the number of terms less one, and the product will be the last term.

Multiply the last term by the ratio, from the product subtract the first term, and divide the remainder by the ratio one; the quotient will be the sum of the series.

## E X A M P L E S.

1 Sold 24 yards of Holland, at 2d. for the first yard, the second, 8d. the third, &c. in a duplicate proportion; how much do they amount to?

1 2 3 4 indices.

2 4 8 16 leading terms.

16

256 8th term.

256

65536 16th ditto

256

16777216 24th, last term.

2 ratio.

33554432

2 first term.

12)33554430 sum of the series.

2,0)279620,2 6

Answer £. 139810 2 6

2 Bought

2 Bought 30 bushels of wheat; the first bushel for 2*d.* the second 4*d.* the third 8*d.* doubling the price of each preceding bushel for that of the next; query the amount, and price per bushel at an average?

*Answer* } 8947848*l.* 10*s.* 6*d.* Amount.  
298261 12 4 per Bushel.

3 Sold 15 yards of sattin, the first yard for 1*s.* the second for 2*s.* the third for 4*s.* &c. what sum did they amount to?

*Answer* 1638*l.* 7*s.*

4 Admit a goldsmith sold one *lb.* of gold, at one farthing for the first ounce, a penny for the second, 4*d.* for the third, &c. in a quadruple proportion; what did it amount to? and what did he gain by it, supposing it cost him 4*l.* per ounce?

*Answer* } 5825*l.* 8*s.* 5*d.*  $\frac{3}{4}$  Sold for.  
5777*l.* 8*s.* 5*d.*  $\frac{3}{4}$  Gained.

5 What sum would purchase a horse with 4 shoes, and 8 nails in each shoe, at one farthing for the first nail, a half penny for the second, a penny for the third, &c. doubling to the last?

*Answer* 4473924*l.* 5*s.* 3*d.*  $\frac{1}{2}$

6 Suppose a man wrought 20 days, and received for the first day 4 barley corns, for the second 12, for the third 36, &c. in triple proportion; what did the twenty days' labor come to, rating the barley at 2*s.* 6*d.* per bushel?

*Answer* 1773*l.* 7*s.* 6*d.*

Note. 7680 wheat, or barley corns, are supposed to make a pint.

7 Sold 30 yards of velvet, at 2 pins for the first yard, 6 for the second, 18 for the third, &c. and these disposed of at one farthing per 100, how much did the velvet amount to? And whether did the feller gain or lose, and how much, supposing the prime cost of the velvet at 50*l.* per yard?

*Answer* } 2144699292*l.* 13*s.* 0*d.*  $\frac{1}{2}$  Amount.  
2144697792*l.* 13*s.* 0*d.*  $\frac{1}{2}$  Gained.

8 A certain person married his daughter on new year's day, and gave her one guinea towards her portion, promising to double it on the first day of every month for one year; what was her portion in sterling money?

*Answer* 4299*l.* 15*s.*

157

# Simple Interest—By Decimals.

## SIMPLE INTEREST—BY DECIMALS.

**Note.** *The ratio is the interest of 1l. for one year, and is thus found :*

$$\text{As } \left\{ \begin{array}{l} \text{£.} \quad \text{£.} \quad \text{£.} \quad \text{£.} \\ 100 \quad \text{..} \quad 5 \quad \text{: :} \quad 1 \quad \text{..} \quad .05 \\ 100 \quad \text{..} \quad 5 \quad 5 \quad \text{: :} \quad 1 \quad \text{..} \quad .055 \\ 100 \quad \text{..} \quad 6 \quad \text{: :} \quad 1 \quad \text{..} \quad .06 \text{ \&c.} \end{array} \right.$$

*Which is only dividing the rate per cent. by 100, by moving the point 2 places to the left.*

A T A B L E of Ratios.

Rate per Cent.	Ratio.	Rate per Cent.	Ratio.
2	.02	6½	.065
3	.03	7	.07
3½	.035	7½	.075
4	.04	8	.08
4½	.045	8½	.085
5	.05	9	.09
5½	.055	9½	.095
6	.06	10	.1

### C A S E I.

The principal, time, and ratio given, to find the interest, and amount ;

### R U L E.

Multiply the principal, time, and ratio together, the last product will be the interest, commission, brokerage, &c. to which add the principal, and the sum will be the amount.

**Note.** In operations of interest by decimals, the money should be in the denomination of pounds, and the time in years, with their parts (if any) annexed decimally.

### E X A M P L E S.

1 Required the amount of 537l. 10s. at 6 per cent. per annum for 5 years?

Principal 537.5 × 5 × .06 = 161.25 Interest.

537.5 Principal.

£. 698.75 = 698l. 15s.      Answer.

0

2 What

## 158 Simple Interest—By Decimals.

2 What is the interest of 917*l.* 16*s.* at 5 per cent. per annum for 7 years? *Answer* 321*l.* 4*s.* 7*d.*

3 If my correspondent be to have  $4\frac{1}{2}$  per cent. what will his commission on 391*l.* 17*s.* come to?

*Answer* 17*l.* 12*s.* 7*d.* $\frac{3}{4}$ +

4 What will be the interest and amount of 567*l.* 10*s.* in 9 years, at 6 per cent. per annum?

*Answer*  $\left\{ \begin{array}{l} 306*l.* 9*s.* Interest. \\ 873*l.* 19*s.* Amount. \end{array} \right.$

5 What is the interest of 4726*l.* 18*s.* 6*d.* $\frac{1}{2}$  for  $3\frac{1}{2}$  years at 7 per cent. per annum? *Answer* 1158*l.* 1*s.* 11*d.*

6 What will 9526*l.* 12*s.* 9*d.* amount to in 12 years and 9 months at 7 per cent. per annum?

*Answer* 18029*l.* 3*s.* 2*d.* $\frac{3}{4}$

### C A S E 2.

The amount, time, and ratio given, to find the principal;

### R U L E.

Multiply the ratio by the time, and add a unit to the product for a divisor, by which divide the amount, and the quotient will be the principal.

### E X A M P L E S.

1 What principal will amount to 1045*l.* 14*s.* in 7 years, at 6 per cent. per annum?

Ratio  $.06 \times 7 + 1 = 1.42$ , Divisor.

$1.42)1045.7(736.4084 = 736*l.* 8*s.* 2*d.* *Answer.*$

2 What principal will amount to 3810*l.* in 6 years, at  $4\frac{1}{2}$  per cent. per annum? *Answer* 3000*l.*

3 What principal will amount to 873*l.* 19*s.* in 9 years, at 6 per cent. per annum? *Answer* 567*l.* 19*s.*

4 What principal will amount to 1819*l.* 1*s.* 11*d.* 28*gr.* in  $12\frac{3}{4}$  years, at 5 per cent. per annum?

*Answer* 1110*l.* 18*s.*

### C A S E 3.

The amount, principal, and time given, to find the rate of interest;

### R U L E.

Subtract the principal from the amount; divide the remainder by the product of the time and principal, and the quotient will be the ratio.

### E X A M P L E S.



## EXAMPLES.

1 At what rate per cent. will 543*l.* amount to 705*l.* 11*s.* in 5 years?

Amount  $705.9 - 543 \div .715 = .06 = \text{rat. } 6 \text{ per cent.}$

2 At what rate per cent. will 391*l.* 17*s.* amount to 449*l.* 3*s.* 1*d.* 3.84*qr.* in  $3\frac{1}{2}$  years? *Answer*  $4\frac{1}{2}\%$ .

3. At what rate per cent, will 4000*l.* amount to 4700*l.* in 5 years? *Answer*  $3\frac{1}{2}\%$ .

4 At what rate per cent. will 7200*l.* amount to 9540*l.* in  $6\frac{1}{2}$  years? *Answer*  $5\%$ .

## C A S E 4.

The amount, principal, and rate per cent. given, to find the time;

## R U L E.

Subtract the principal from the amount; divide the remainder by the product of the ratio and principal, and the quotient will be the time.

## EXAMPLES.

1 In what time will 543*l.* amount to 705*l.* 18*s.* at 6 per cent. per annum?

Amount  $705.9 - 543 \div 32.58 = 5 \text{ years.}$  *Answer.*

2 In what time will 391*l.* 17*s.* amount to 449*l.* 3*s.* 1*d.* 3.84*qr.* at  $4\frac{1}{2}\%$  per cent. per annum? *Answer*  $3\frac{1}{2}$  years.

3 In what time will 7200*l.* amount to 9540*l.* at 5 per cent. per annum? *Answer*  $6\frac{1}{2}$  years.

4 In what time will 1110*l.* 18*s.* amount to 1819*l.* 11*s.* 11*d.* 2.8*qr.* at 5 per cent. per annum? *Answer*  $12\frac{3}{4}$  years.

Note. Although it is customary to compute the interest of money by the rules of simple interest; yet these rules are by no means proper for practical computations, where the amount or present worth of periodical payments are considered, as they sometimes give a result less than half, or more than twice, the equitable sum; wherefore the editors of this work think it unnecessary to swell the book, or detain their pupils, with the several cases of annuities at *simple* interest; but have instead thereof, enlarged those of *compound*, by inserting suitable tables for facilitating the operation, &c.

## COMPOUND INTEREST—BY DECIMALS.

The ratio for compound interest is the amount of 1*l.* for 1 year at the given rate. It is found thus:



# 160 Compound Interest—By Decimals.

As 100*l.* : 106*l.* :: 1*l.* : 1.06*l.* &c. or, by adding the rate per cent. to 100*l.* and moving the decimal point of the sum two places towards the left hand.

The amounts of 1*l.* for quarters of a year are found thus:

$\sqrt[4]{1.06} = 1.014674$ , for 1 quarter;  $\sqrt[2]{1.06} = 1.029563$ , for 2; and  $1.014674 \times 1.029563 = 1.044671$ , for 3 quarters.

The ratio involved to the time is the amount of 1*l.* for the time proposed; or, it is that power of the ratio which is indicated by the given number of years; as a square for 2 years, a cube of 3, &c. thus,  $1.06 \times 1.06 \times 1.06 \times 1.06$  or  $\overline{1.06}^4 = 1.262477$  = the 4th power of 1.06 or the ratio involved to 4 years.

When the ratio is to be involved to years and quarters, the power for the years is to be multiplied by the proper quarterly amount; as,  $1.262477 \times 1.044671 = 1.318873$  for  $4\frac{1}{4}$  years, &c.

The power of the amount of 1*l.* may also be obtained for months and days (nearly) by adding the monthly simple interest of 1*l.* or proper parts thereof, to the amount of the quarter next preceding the expiration of the given time, for what that time exceeds the said quarter; thus;

Amount for  $\frac{1}{4}$  yr. = 1.029563; For  $4\frac{1}{4}$  yr. = 1.318873

Int. of 1*l.* for 1mo. = .005000; = .005000

One sixth for 5da. = .000833; = .000833

For 7mo. 5da. = 1.035396 For 4yr. 10mo. 5da. = 1.324706

The ratio may be thus involved to any time whatever; but the operation is facilitated by the following tables; which may be extended to 100 years, or upwards, by multiplying the amount for 50, by that for the time above 50; &c.

T A B L E I.

Rate per Cent	Amounts of 1 <i>l.</i> for a year and for quarters, at Compound Interest.				Sim. Int. of 1 <i>l.</i> for 1 month.
	Ratio.	For 3 qrs.	For 2 qrs.	For 1 qr.	
3	1.03	1.022416	1.014889	1.007417	.002500
$3\frac{1}{2}$	1.035	1.026137	1.017349	1.008637	.002917
4	1.04	1.029852	1.019804	1.009853	.003333
$4\frac{1}{2}$	1.045	1.033563	1.022252	1.011065	.003750
5	1.05	1.037270	1.024695	1.012272	.004167
$5\frac{1}{2}$	1.055	1.040973	1.027132	1.013475	.004583
6	1.06	1.044671	1.029536	1.014674	.005000
$6\frac{1}{2}$	1.065	1.048364	1.031988	1.015868	.005417
7	1.07	1.052053	1.034408	1.017058	.005833

TABLE II. Shewing the amount of 1*l.* from 1 year to 50

yr	$3\frac{1}{2}$ per ct.	4 per cent.	$4\frac{1}{2}$ per ct.	5 per cent.	$5\frac{1}{2}$ per cent.	6 per cent.
1	1.0350000	1.0400000	1.0450000	1.0500000	1.0550000	1.0600000
2	1.0712250	1.0816000	1.0920250	1.1025000	1.1130250	1.1236000
3	1.1087178	1.1248640	1.1411661	1.1576250	1.1742413	1.1910160
4	1.1474230	1.1698585	1.1925186	1.2153062	1.2388246	1.2624769
5	1.1876863	1.2166529	1.2461819	1.2762815	1.3069598	1.3382256
6	1.2292553	1.2653190	1.3022601	1.3400950	1.3788426	1.4185191
7	1.2722792	1.3159317	1.3608618	1.4071004	1.4546789	1.5036302
8	1.3168090	1.3685090	1.4221006	1.4774554	1.5346862	1.5938480
9	1.3628973	1.4233118	1.4860951	1.5513282	1.6190939	1.6894789
10	1.4105987	1.4802442	1.5529694	1.6288946	1.7081440	1.7908476
11	1.4599697	1.5394540	1.6228530	1.7103393	1.8020919	1.8982985
12	1.5110686	1.6010322	1.6958814	1.7958503	1.9012069	2.0121964
13	1.5639560	1.6650735	1.7721961	1.8856491	2.0057732	2.1329282
14	1.6186945	1.7316764	1.8519449	1.9799316	2.1160909	2.2609039
15	1.6753488	1.8009435	1.9352824	2.0789281	2.2324756	2.3965581
16	1.7339386	1.8729812	2.0223701	2.1828745	2.355617	2.5403517
17	1.7946755	1.9479005	2.1133768	2.2920183	2.4848011	2.6927727
18	1.8574892	2.0258161	2.2084787	2.4066192	2.6214652	2.8548391
19	1.9225013	2.1068491	2.3078603	2.52269502	2.7656458	3.0255995
20	1.9897888	2.1911231	2.4117140	2.6532977	2.9177563	3.2071355
21	2.0594314	2.2787680	2.5202411	2.7859625	3.0782329	3.3995036
22	2.1315115	2.3699187	2.6336502	2.9225607	3.2475357	3.6035374
23	2.2061144	2.4647455	2.7511663	3.0715237	3.42401502	3.8197496
24	2.2833284	2.5633041	2.8760138	3.2250999	3.6145885	4.0489346
25	2.3632449	2.6658363	3.0054344	3.3863549	3.8133910	4.2918707
26	2.4459985	2.7724697	3.1406790	3.5556726	4.0231279	4.5492829
27	2.5315671	2.8833685	3.2820095	3.7334563	4.2443999	4.8223459
28	2.6201719	2.9987033	3.4296999	3.9201291	4.4778419	5.1116867
29	2.7118779	3.1186514	3.5840364	4.1161356	4.7241232	5.4183879
30	2.8067937	3.2433975	3.7453181	4.3219423	4.9839499	5.7434912
31	2.9050314	3.3731334	3.9138574	4.5380394	5.2580671	6.0881007
32	3.0067075	3.5080587	4.0899810	4.7649414	5.5472608	6.4533867
33	3.1119423	3.6483811	4.2740301	5.0031885	5.8523600	6.8405899
34	3.2208603	3.7943163	4.4663615	5.2533479	6.1742396	7.2510253
35	3.3333004	3.9460889	4.6673478	5.5160152	6.5138230	7.6860868
36	3.4502661	4.1039325	4.8773784	5.7918101	6.8720832	8.147252
37	3.5710254	4.2680898	5.0968604	6.0814069	7.2500478	8.6360871
38	3.6960113	4.4388134	5.3262192	6.3854772	7.6488004	9.1542523
39	3.8253717	4.6163659	5.5658990	6.7047511	8.0694844	9.7035074
40	3.9592597	4.8010206	5.8163645	7.0399887	8.5133060	10.2857178
41	4.0978337	4.9930614	6.0781009	7.3919881	8.9815378	10.9028608
42	4.2412579	5.1927838	6.3517246	7.7615871	9.4755224	11.5570325
43	4.3897020	5.4004952	6.6375522	8.1496669	9.9966761	12.2505481
44	4.5433415	5.616515	6.9362421	8.5571502	10.5464933	12.9854547
45	4.7023358	5.8411756	7.248373	8.9850077	11.1265504	13.7646107
46	4.8669411	6.0748236	7.5745497	9.4342581	11.7383217	14.5904873
47	5.0378040	6.3178166	7.9154045	9.9059710	12.3841404	15.4659166
48	5.215882	6.570529	8.2715977	10.4012690	13.0652681	16.3938716
49	5.3906645	6.8333493	8.6438190	10.9213331	13.7838579	17.3775039
50	5.5728268	7.1066833	9.0327915	11.4673697	14.5419700	18.4201541

## C A S E 1.

The principal, time, and rate given, to find the amount;

## R U L E.

Multiply the principal by the ratio involved to the time, (found either by involution, or in table II.) and the product will be the amount.

## E X A M P L E S.

1 What sum will 450*l.* amount to in three years time, at 5 per cent. per annum?

1.05 raised to the 3d power = 1.157625; and  
 $1.157625 \times 450 = 520.93125*l.* = 520*l.* 18*s.* 7*d.*  $\frac{1}{2}$  Answer.$

2 What is the amount of 570*l.* 10*s.* for 12 years, at 3  $\frac{1}{2}$  per cent. per annum? *Answer* 862*l.* 1*s.* 3*d.*  $\frac{1}{2}$

3 What will 400*l.* amount to in 4 years, at 6 per cent. per annum? *Answer* 504*l.* 19*s.* 9*d.*  $\frac{3}{4}$

4 At 6 per cent. per annum for 20 years, what will 136*l.* 15*s.* 6*d.* amount to, and what is the compound interest? *Answer* amount 438*l.* 13*s.* 1*d.*  $\frac{1}{2}$ ; interest 301*l.* 17*s.* 7*d.*  $\frac{1}{2}$

5 What is the compound interest of 764*l.* for 4 years and 9 months, at 6 per cent. per annum?

*Answer* 243*l.* 12*s.* 4*d.*  $\frac{1}{4}$

6 What is the amount at compound interest of 259*l.* 10*s.* 6*d.* for three years, 7 months, and 15 days, at 4  $\frac{1}{2}$  per cent. per annum? *Answer* 304*l.* 4*s.* 2*d.*  $\frac{1}{2}$

## C A S E 2.

## DISCOUNT AT COMPOUND INTEREST.

Or, the amount, rate, and time given to find the principal;

## R U L E.

Divide the amount by the ratio involved to the time.

## E X A M P L E S.

1 What principal must be put to interest, to amount to the sum of 520*l.* 18*s.* 7*d.*  $\frac{1}{2}$  in 3 years, at 5 per cent. per annum?

$\pounds.520\ 18*s.* 7*d.*  $\frac{1}{2}$  =  $\pounds.520.93125$   
 $1.05 \times 1.05 \times 1.05 = 1.157625$   
 $1.157625)520.931250(\pounds.450$  *Answer.*$

2 What



2 What principal will amount to 390*l.* 15*s.* 7*d.*  $\frac{1}{4}$  in 6 years at  $4\frac{1}{2}$  per cent. per annum? *Answer* 300*l.*

3 What principal will amount to 619*l.* 8*s.* 2*d.* 3.8323 *gr.* in 4 years at  $5\frac{1}{2}$  per cent. per annum? *Answer* 500*l.*

4 What is the present worth of 520*l.* 18*s.* 7*d.*  $\frac{1}{2}$  payable 3 years hence, at 5 per cent? *Answer* 450*l.*

5 There is a debt of 504*l.* 19*s.* 9*d.*  $\frac{3}{4}$  which is not due until 4 years hence, but is agreed to be paid in present money; what sum must the creditor receive, allowing the discount at 6 per cent? *Answer* 400*l.*

6 What is the present worth of 1007*l.* 12*s.* 4*d.*  $\frac{1}{2}$ , due 4 years and 9 months hence, discounting at the rate of 6 per cent. per annum? *Answer* 764*l.*

7 What sum will purchase a bond of 304*l.* 4*s.* 2*d.*  $\frac{1}{2}$  payable 3 years, 7 months, and 15 days hence, at  $4\frac{1}{2}$  per cent? *Answer* 259*l.* 10*s.* 6*d.*

### C A S E 3.

The principal, rate, and amount given, to find the time;

### R U L E.

Divide the amount by the principal, and invole the ratio till it equals the quotient; the power to which it is raised, will indicate the time: Or,

*By Table II.*

Divide as before; find the quotient under the rate, and it will shew the time against it in the same line.

Note. If the quotient be between 2 numbers under the rate, then say, as the difference of these 2 numbers, is to 1 year, so is the difference between the preceding number and the quotient, to the parts (nearly) which are to be annexed to the next preceding year.

### E X A M P L E S.

1 In what time will 450*l.* amount to 520*l.* 18*s.* 7*d.*  $\frac{1}{2}$  at 5 per cent. per annum?

$$450)520.93125(1.157625, \text{ and}$$

$$1.157625 = 1.05 \times 1.05 \times 1.05 = 1.05 \text{ for 3 yrs. } \textit{Answer.}$$

By the table, 1.157625, under 5 per cent. stand opposite 3 years.

# 164 *Compound Interest—By Decimals.*

2 In what time will 600*l.* amount to 757*l.* 9*s.* 8*d.* $\frac{1}{2}$ , at 6 per cent. per annum? *Answer* 4 years.

3 In what time will 500*l.* amount to 590*l.* 11*s.* 5*d.* $\frac{1}{2}$ , at 4 $\frac{1}{2}$  per cent. per annum? *Answer* 4 years.

4 In what time will 764*l.* amount to 1007*l.* 12*s.* 4*d.* $\frac{1}{2}$ , at 6 per cent? *Answer* 4yrs. 9mo.

5 How long must a bond of 259*l.* 10*s.* 6*d.* continue at 4 $\frac{1}{2}$  per cent. to amount to 304*l.* 4*s.* 2*d.* $\frac{1}{2}$ ? *Answer* 3 yrs. 7mo. 15*ds.*

## C A S E. 4.

The principal, amount, and time given, to find the rate of interest;

## R U L E.

Divide as in case 3, and extract such a root of the quotient as is indicated by the time. Or,

*By Table II.*

Find the quotient against the time, and over it the rate per cent.

*Note.* When the time consists of parts of a year or of years and parts, express it in the vulgar fraction of a year in its lowest terms; then involve the quotient mentioned in the rule to the power indicated by the denominator, and from this power extract the root denoted by the numerator for the ratio; or, find the numerator in the column of years (table II.) and the said power opposite thereto, and over this, the rate required.

## E X A M P L E S.

1 At what rate per cent. will 450*l.* amount to 520*l.* 18*s.* 7*d.* $\frac{1}{2}$  in 3 years?

450)520.93125(1.157625, and

$\sqrt[3]{1.157625}=1.05$ =the ratio of 5*l.* per cent. *Answer.*

By the table: Find 1.157625 opposite 3 years, and over it 5 per cent.

2 At what rate per cent. will 7200*l.* amount to 9886*l.* 19*s.* 4*d.* in 6 $\frac{1}{2}$  years? *Answer* 5 per cent.

3 At what rate per cent. will 600*l.* 14*s.* amount to 932*l.* 17*s.* 4*d.* in 10 years? *Answer* 4 $\frac{1}{2}$  per cent.

4 At what rate of interest per cent. will 764*l.* amount to 1007*l.* 12*s.* 4*d.* $\frac{1}{2}$  in 4 years and 9 months?

*Answer* 6 per cent.  
ANNUITIES



## ANNUITIES AT COMPOUND INTEREST.

**A**N annuity is a sum of money payable yearly, half yearly, or quarterly, for a number of years, during life, or for ever; and may draw interest if it remain unpaid after it becomes due.

Tables to facilitate the calculations of annuities.

TABLE III. Shewing the amount of 1l. annuity.

yr.	4 per cent.	4½ per cent.	5 per cent.	5½ per cent.	6 per cent.	yr.
1	I.	I.	I.	I.	I.	1
2	2.04	2.045	2.05	2.055	2.06	2
3	3.1216	3.137025	3.1525	3.168225	3.1836	3
4	4.246464	4.278191	4.310125	4.342266	4.374602	4
5	5.416322	5.47071	5.525631	5.581091	5.637093	5
6	6.632975	6.716892	6.801913	6.888051	6.975318	6
7	7.898294	8.019152	8.142008	8.266894	8.393837	7
8	9.214226	9.380014	9.549109	9.721573	9.897468	8
9	10.582795	10.802114	11.026564	11.256259	11.491316	9
10	12.006107	12.28821	12.577892	12.875354	13.180795	10
11	13.486351	13.841179	14.206787	14.583498	14.971643	11
12	15.025805	15.464032	15.917126	16.38559	16.869942	12
13	16.626838	17.159913	17.712983	18.286798	18.882138	13
14	18.291911	18.932109	19.598632	20.292572	21.015066	14
15	20.023388	20.784054	21.578563	22.408663	23.275971	15
16	21.814551	22.719337	23.657492	24.64114	25.672528	16
17	23.667512	24.741707	25.840366	26.996402	28.212831	17
18	25.645413	26.855084	28.132385	29.481205	30.905653	18
19	27.671229	29.063562	30.539004	32.102671	33.759993	19
20	29.778078	31.371423	33.065954	34.868318	36.785592	20
21	31.969202	33.783137	35.719252	37.786075	39.992728	21
22	34.24797	36.303378	38.505214	40.864309	43.392291	22
23	36.617888	38.93703	41.430475	44.111846	46.995828	23
24	39.082604	41.689196	44.501999	47.537998	50.815578	24
25	41.645958	44.56521	47.727099	51.152588	54.864513	25
26	44.311745	47.570645	51.113484	54.965979	59.156383	26
27	47.084214	50.711324	54.669126	58.989109	63.705766	27
28	49.967582	53.993333	58.402583	63.23351	68.528117	28
29	52.966286	57.423033	62.322712	67.711353	73.637998	29
30	56.084938	61.007069	66.438847	72.415478	79.058186	30
31	59.328335	64.752388	70.76079	77.419429	84.801677	31
32	62.701469	68.666245	75.29889	82.677498	90.89778	32
33	66.209527	72.756226	80.063771	88.22476	97.343165	33
34	69.857904	77.030256	85.066959	94.077122	104.183754	34
35	73.652225	81.496618	90.320307	100.251363	111.447803	35
36	77.598314	86.163966	95.836323	106.765188	119.28067	36
37	81.702246	91.041344	101.628139	113.637274	127.688118	37
38	85.970336	96.138205	107.709546	120.887324	135.904206	38
39	90.40975	101.464424	114.095025	128.536127	145.058456	39
40	95.025516	107.030323	120.799774	136.605614	154.761966	40

TABLE IV. Shewing the present worth of  $\text{£}1$ . annuity, for any number of years, from 1 to 40.

yr.	4 per cent.	$4\frac{1}{2}$ p. cent.	5 per cent.	$5\frac{1}{2}$ p. cent.	6 p. cent.	yr.
1	0,96154	0,95694	0,95231	0,94786	0,94339	1
2	1,88609	1,87267	1,85941	1,84632	1,83339	2
3	2,77509	2,74876	2,72325	2,69793	2,67301	3
4	3,62989	3,58752	3,54595	3,50514	3,46511	4
5	4,45182	4,38997	4,32948	4,27028	4,21236	5
6	5,24214	5,15787	5,07569	4,99553	4,91732	6
7	6,00205	5,8927	5,78637	5,68297	5,58238	7
8	6,73274	6,59589	6,46321	6,33457	6,20979	8
9	7,43533	7,26879	7,10782	6,95220	6,80169	9
10	8,11089	7,91272	7,72173	7,53762	7,36008	10
11	8,76048	8,52892	8,30641	8,09254	7,88687	11
12	9,38507	9,11858	8,86325	8,61852	8,38384	12
13	9,98565	9,68285	9,39357	9,11708	8,85268	13
14	10,56312	10,22282	9,89864	9,58965	9,29498	14
15	11,11839	10,73954	10,37965	10,03759	9,71225	15
16	11,65229	11,23401	10,83777	10,46216	9,20589	16
17	12,16567	11,70719	11,27407	10,86461	10,47726	17
18	12,65929	12,15999	11,68958	11,24607	10,8276	18
19	13,13394	12,59329	12,08532	11,60765	11,15811	19
20	13,59032	13,00793	12,46221	11,95034	11,46992	20
21	14,02916	13,40472	12,82115	12,27524	11,76407	21
22	14,45111	13,78442	13,163	12,58317	12,04158	22
23	14,85684	14,14777	13,48857	12,87504	12,30338	23
24	15,24696	14,49548	13,79864	13,15170	12,55035	24
25	15,62208	14,82821	14,09394	13,41391	12,78335	25
26	15,98277	15,14661	14,37518	13,66250	13,00316	26
27	16,32959	15,4513	14,64303	13,89810	13,21053	27
28	16,66306	15,74287	14,89813	14,12142	13,40616	28
29	16,98371	16,02189	15,14107	14,33310	13,59072	29
30	17,29203	16,28889	15,37245	14,53375	13,76483	30
31	17,58849	16,54439	15,59281	14,72393	13,92908	31
32	17,87355	16,78889	15,80268	14,90420	14,08404	32
33	18,14764	17,02286	16,00255	15,07507	14,23023	33
34	18,41126	17,24676	16,1929	15,23703	14,36814	34
35	18,66461	17,46101	16,37419	15,39055	14,49825	35
36	18,90828	17,66604	16,54685	15,53607	14,62098	36
37	19,14258	17,86224	16,71129	15,67400	14,73678	37
38	19,36786	18,04999	16,86789	15,80474	14,84602	38
39	19,58448	18,22965	17,01704	15,92866	14,94907	39
40	19,79277	18,40158	17,15909	16,04612	14,92640	40

TABLE V.

Rate per cent	half yearly payments.	quarterly payments.
3	1,007445	1,011181
3½	1,008675	1,013031
4	1,009902	1,014877
4½	1,011126	1,016720
5	1,012348	1,018559
5½	1,013567	1,020395
6	1,014781	1,022257
6½	1,015993	1,024055
7	1,017204	1,025880

The construction of this table is from an algebraic theorem, given by the learned A. De Moivre, in his treatise of *Annuities on Lives*, which may be in words thus;

For half yearly payments, take a unit from the ratio, and from the square-root of the ratio;  $\frac{1}{2}$  the quotient of the first remainder divided by the latter will be the tabular number.

For quarterly payments, use the 4th root as above, and take  $\frac{1}{4}$  of the quotient.

C A S E. 1.

The annuity, time, and rate of interest given, to find the amount;

R U L E.

Take a unit from the ratio for a divisor, and from the ratio involved to the time for a dividend; the quotient, multiplied by the annuity, will be the amount for yearly payments. Or, *By Table III.*

Multiply the number under the rate, and opposite to the time, by the annuity, and the product will be the amount for yearly payments.

If the payments be half yearly or quarterly, the amount for the given time, found as above, multiplied by the proper number in table V. will be the true amount.

E X A M P L E S.

1 What will an annuity of 30*l.* per annum payable yearly amount to in 4 years at 5 per cent. per annum, and what would be the respective amounts if the payments were to be half yearly or quarterly?

$$1.05 - 1 = .05$$

$$1.05 \times 1.05 \times 1.05 \times 1.05 - 1 = 21550625$$

Same as No. Table III.

$$4.310125$$

30

Amt. for yearly payments  $\pounds$ . 129.30375; which  
 $\times 1.012348$ , from table V. = 130.9004, for half yearly,  
 Or,  $\times 1.018559$ , from do. = 131.7035, for quarterly pay-  
 ments.



168 *Annuities at Compound Interest.*

2 How much will a pension of 50*l.* per annum amount to in 5 years, at 4 per cent? *Answer* 270*l.* 16*s.* 3*d.*

3 If a yearly rent of 50*l.* be in arrears for 7 years at 1 per cent. what will it amount to? *Answer* 335*l.* 15*s.* 0*d.*

4 If a salary of 35*l.* per annum be unpaid for 6 years what is the amount at 5½ per cent? *Answer* 241*l.* 1*s.* 7*d.*

5 What would 10*l.* a year, payable half yearly, amount to in 9 years at 5 per cent? *Answer* 111*l.* 12*s.* 6*d.*

C A S E 2.

The amount, rate, and time given, to find the annuity

R U L E.

Take a unit from the ratio involved to the time for divisor, and multiply the amount by the ratio less one, for a dividend; the quotient will be the annuity; Or,

*By Table III.*

Divide the amount by the number under the ratio, and opposite to the time; the quotient will be the annuity.

When the payments are half yearly or quarterly, divide the annuity so found by the proper number in table V.

E X A M P L E S.

1 What annuity, being unpaid for 4 years, will amount to 129*l.* 6*s.* 1*d.* at 5 per cent?

$$\text{Amount} = 129.304166$$

$$\begin{array}{r} \text{.05} \\ \hline 1.05 \times 1.05 \times 1.05 \times 1.05 - 1 = .21550625 \quad 6.46520830(3) \\ \hline 6.4651875 \quad \text{An} \\ \hline 2080 \end{array}$$

By Table III. 4.310125) 129.304166 (30*l.* yearly,

Table V. 1.012348) 30. (29.6341 half yearly; or,

Ditto 1.018559) 30. (29.4534 quarterly.

2 If a pension forborne 5 years, amount to 270*l.* 16*s.* 4*d.* at 4 per cent. how much is it per annum?

*Answer* 50

3 How much per annum, at 6 per cent. will amount to 15*s.* 1*d.* in seven years?

*Answer* 1*s.* 4*d.*

4 The payment of a salary was omitted for 6 years, and then the amount, at  $5\frac{1}{2}$  per cent. found to be  $241\text{ l. } 1\text{ s. } 7\text{ d. } \frac{3}{4}$ . how much was it per annum? *Answer*  $35\text{ l.}$

5 What annuity, payable half yearly, would amount to  $111\text{ l. } 12\text{ s. } 6\text{ d. } \frac{1}{2}$  in 9 years at 5 per cent? *Answer*  $10\text{ l.}$

C A S E 3.

The annuity, amount, and rate of interest given, to find the time;

R U L E.

Multiply the amount by the ratio less one, divide the product by the annuity, and add a unit to the quotient; then involve the ratio up to the sum; and the power to which it is raised will indicate the time; Or,

Find the said sum in table II. under the rate, and against it in the column of the years, will be the time required.

*Note.* If the Sum be not an even yearly power, work as per note to case 3, page 163.

E X A M P L E S.

1 In what time will  $30\text{ l.}$  per annum amount to  $129\text{ l. } 6\text{ s. } 1\text{ d.}$  allowing compound interest at 5 per cent?

$$\begin{array}{r} \text{£ } 129\ 6\ 1 = 129.30416 \\ \text{Ratio } 1.05 - 1 = .05 \end{array}$$

$$\text{Annuity } 3,0)6.4652080$$

Quotient  $+ 1 = 1.21550693$ ; then,  
 $1.05 \times 1.05 \times 1.05 \times 1.05 = 1.21550625 =$  the 4th power of the ratio, indicating 4 years for the answer.

2 In what time will a pension of  $50\text{ l.}$  per annum amount to  $270\text{ l. } 16\text{ s. } 4\text{ d.}$  at 4 per cent? *Answer* 5 years.

3. In what time will the yearly rent of a house, at  $40\text{ l.}$  per annum amount to  $335\text{ l. } 15\text{ s. } 1\text{ d.}$  at 6 per cent?

*Answer* 7 years.

4 In what time will a salary of  $35\text{ l.}$  per annum amount to  $241\text{ l. } 1\text{ s. } 7\text{ d. } \frac{3}{4}$ , at  $5\frac{1}{2}$  per cent? *Answer* 6 years

C A S E 4.

The annuity, time, and rate given, to find the present worth;

P

R U L E.



# R U L E.

Divide the annuity by the ratio involved to the time, and subtract the quotient from the annuity; divide the remainder by the ratio less one, and the quotient will be the present worth: or,

*By Table IV.*

Multiply the number under the rate, and opposite the time by the annuity, and the product will be the present worth.

When the payments are half yearly or quarterly, multiply the present worth so found, by the proper number in table V.

## E X A M P L E S.

1 What is the present worth of 20*l.* a year for 6 years, payable either yearly, half yearly or quarterly, computing at 5 per cent. per annum?

$$\begin{array}{r} \text{6} \\ \text{---} | = 1.3400956 \end{array} \begin{array}{r} \text{£. 2.0} \\ 20. (14.924308 \\ .05) 5.075692 \end{array}$$

Or, by table IV.  $5.07569 \times 20 = 101.5138$  = the present worth for yearly payments: then by table V.

$101.5138 \times 1.012348 = \text{£. } 102.7673$ , for half yearly.

$101.5138 \times 1.018559 = \text{£. } 103.3978$ , for quarterly.

2 What is the present worth of an annuity of 30*l.* per annum, to continue 5 years, at 4 per cent?

*Answer* 133*l.* 11*s.* 1*d.*

3 What ready money will purchase an annuity of 50*l.* to continue 4 years, at 6 per cent? *Answer* 173*l.* 5*s.* 1*d.*

4 If the yearly rent of an estate be 70*l.* what sum will purchase it for 4 years, at  $5\frac{1}{2}$  per cent?

*Answer* 245*l.* 7*s.* 2*d.*

## C A S E 5.

The present worth, time, and ratio given, to find the annuity?

## R U L E.

Multiply the ratio involved to the time, the ratio less 1 and the present worth together for a dividend; take a unit from the ratio involved to the time for a divisor, the quotient will be the annuity: Or,

*By*

By Table IV.

Divide the present worth by the number for the rate and time; and the quotient will be the annuity.

When the payments are half yearly or quarterly, use table V. as at case 2d.

EXAMPLES.

1 What annuity payable yearly, half yearly or quarterly, for 6 years may be purchased for 101*l.* 10*s.* 3*d.* $\frac{1}{2}$  at 5 per cent. per annum, compound interest?

$$\begin{array}{r} 1.05 \overline{) 101.514} = 1.340096 \\ \underline{.05} \\ .06700480 \\ \underline{415.101 \text{ inverted}} \end{array}$$

By table IV.	{	101.514		670048
		Divided by		6700
		5.07569		3350
		Equal 20 <i>l.</i>		67
				27
				$\underline{\text{£.}}$

then 20*l.*  $\div$   $\left\{ \begin{array}{l} .340096 \times 6 = 2.040192 \text{ (20, yearly.)} \\ 1.021348 = 19.7561 \text{ half yearly.} \\ 1.081559 = 19.6356 \text{ quarterly.} \end{array} \right\}$  Answer.

2 What annuity for 5 years, will 133*l.* 11*s.* 1*d.* present money purchase, at 4 per cent? Answer 30*l.*

3 If the present payment of 173*l.* 5*s.* 1*d.* $\frac{1}{4}$  be made at 6 per cent. for the lease of a house 4 years to come; what is the yearly rent? Answer 50*l.*

4 Suppose the lease of a house for 4 years be sold for 245*l.* 7*s.* 2*d.* $\frac{1}{2}$  what is the yearly rent, allowing 5 $\frac{1}{2}$  per cent? Answer 70*l.*

CASE 6.

The annuity, present worth, and ratio given, to find the time;

RULE.

Multiply the present worth by the ratio less one, subtract the product from the annuity, and divide the annuity by the remainder; then, involve the ratio till it equals (or nearly

nearly equals) the quotient, and the power to which it is raised will indicate the time. Or,

Find the quotient in table II. under the rate, and against it, in the left column, stands the time.

### EXAMPLES.

1 How long may a lease of 20*l* yearly rent be possessed for 101*l*. 10*s*. 3*d.* $\frac{1}{2}$  down, allowing 5 per cent. per annum to the purchaser?

$$101.51458 = \text{present worth.}$$

$$.05 = \text{Ratio} - 1$$

$$\begin{array}{r} 1.0757290 \\ 20. \end{array}$$

$$14.924271) 20.000000 ( 1.34009 = 1.05 \overset{6}{|}$$

indicating 6 years for the answer.

2 For what time will 133*l*. 11*s*. 1*d.* purchase a lease of 30*l*. a year, at the rate of 4 per cent; *Answer* 5 years.

3 If 173*l*. 5*s*. 1*d.* $\frac{1}{2}$  be paid down for a lease of 50*l*. per annum at 6 per cent. for what time is the purchase made?

*Answer* 4 years.

4 If a house be let for 70*l*. per annum, and the lessee make present payment of 245*l*. 7*s*. 2*d.* $\frac{1}{2}$  at 5 $\frac{1}{2}$  per cent. for what term is the lease purchased?

*Answer* 4 years.

### ANNUITIES, &c. IN REVERSION.

#### C A S E I.

The annuity, time of reversion, time of continuance and ratio given, to find the present worth;

#### R U L E.

Divide the annuity by the ratio involved to the time of continuance, and subtract the quotient from the annuity for a dividend; multiply the ratio involved to the time of reversion by the ratio less one for a divisor; the quotient of this division will be the present worth. Or,

Take two numbers under the given rate in table IV, *viz.* that opposite the sum of the two given times, and that against the time of reversion, and multiply their difference by the annuity for the present worth.

When the payments are half yearly or quarterly, use table V. as at case 4th. of annuities, page 170.

### EXAMPLES.





174 *Annuities, &c. taken in Reversion.*

$$\frac{1.05^4}{1.05} - 1 = .2155062 \quad 1.3400956 = \frac{1.05^6}{1.05} (6.21836)$$

Present worth inverted 623.46

Product 400.001

.05

*Answer* £. 20.00005

From table IV. { 5.07569 for 6 years.  
1.85941 for 2 years.

Difference 3.21628) 64.326 (20£. *Answer.*

2 A lease of certain lands is in being for 4 years yet to come, and another given for 7 years to commence when the former is expired, on condition that 15*zl.* 6*s.* 8*d.*  $\frac{1}{4}$  be paid immediately; what is the yearly rent of said lands, allowing 5 per cent. for present payment? *Answer* 32*l.*

3 The present payment for the lease of a house is 62*zl.* 9*s.* 7*d.*  $\frac{1}{2}$ , the lease to commence 2 years hence, and to continue eight years; how much is the yearly rent when 4 per cent. is allowed for present money? *Answer* 100*l.*

C A S E. 3.

The present worth, annuity, rate of interest and time of reversion given, to find the time of continuance;

R U L E.

Subtract the continued product of the ratio involved to the time of reversion, the ratio less one and the present worth from the annuity, and divide the annuity by the remainder. Then involve the ratio till it (nearly) equals the quotient, and the power will indicate the time required. Or.

Find the said quotient in table II. under the rate, and against it stands the time.

E X A M P L E S.

1 A lease of 20*l.* per annum to commence 2 years hence is worth 64*l.* 6*s.* 6*d.*  $\frac{1}{4}$  ready money, for what time must it continue, when 5 per cent. per annum is allowed to the purchaser?



$$\begin{array}{r} 20. \text{ annuity.} \\ 1.05 \mid \times .05 \times 64.326 = 3.54597 \end{array}$$

$$16.45403) 20. (1.215506,$$

which is the 4th power of the ratio, indicating 4 years for the answer.

2 For a lease of 32*l.* per annum, which is not to commence till the expiration of 4 years, a purchaser lays down 152*l.* 6*s.* 8*d.*  $\frac{1}{2}$  being the present worth at 5 per cent. how long is he to possess the premises? *Answer* 7 years.

3 The yearly rent of an 100*l.* to commence 2 years hence, is sold at 4 per cent. for 622*l.* 9*s.* 7*d.*  $\frac{1}{2}$ ; how long is it to continue? *Answer* 8 years.

## PERPETUITIES.

**P**ERPETUITIES are perpetual annuities, or such as continue for ever.

*Note.* For perpetual half yearly or quarterly payments, table V. is to be applied as in the similar cases of temporary annuities foregoing.

### C A S E 1.

The annuity and ratio given, to find the present worth;

#### R U L E.

Divide the annuity by the ratio less one, the quotient will be the present worth.

### E X A M P L E S.

1 What sum will purchase a freehold estate of 40*l.* per annum, calculating at 5 per cent. and supposing the payments either yearly, half yearly or quarterly?

$$1.05 - 1 = .05 \mid 40.800 \text{ if yearly?}$$

$$\text{then, } 800 \times \begin{cases} 1.012348 = 809.8784, & \text{if half yearly;} \\ 1.018559 = 814.8472, & \text{if quarterly.} \end{cases}$$

2 What is the present worth of an estate in fee simple of 290*l.* per annum allowing 4 per cent. to the purchaser?

*Answer* 7250*l.*

### C A S E 2.

The present worth, and ratio given, to find the annuity;

#### R U L E

## R U L E.

Multiply the present worth by the ratio less one, the product will be the annuity.

## E X A M P L E S.

1 A freehold estate, bought for 800*l.* ready money, at 5 per cent. what is the annuity?

$$\begin{array}{r} \text{£.} \\ 800 \\ 1.05 - 1 = .05 \end{array}$$

*Answer* £. 40 00

2 If an estate be sold for 725*l.* present money, and 4 per cent. be allowed to the buyer, how much is the income per annum?

*Answer* 290*l.*

## C A S E. 3.

The present worth and annuity given, to find the ratio;

## R U L E.

Divide the sum of the present worth and annuity, by the present worth, the quotient will be the ratio.

## E X A M P L E S.

1 If a real estate of 40*l.* per annum be sold for 800*l.* what is the rate per cent?

*Answer* 5*l.* per cent.

$$\begin{array}{r} 800 \\ 40 \end{array}$$

800)840(1.05 = the ratio of 5 per cent.

2 If a freehold estate of 290*l.* per annum be bought for 725*l.* the rate per cent. is required?

*Answer* 4 per cent.

## C A S E. 4.

The ratio given to find the years' purchase;

## R U L E.

Divide a unit by the ratio less 1, and the quotient will be the years purchase.

## E X A M P L E S.

1 How many years' purchase should a gentleman offer for perpetuity, to have 6 per cent. for his money?

.06)1.00(16 $\frac{2}{3}$  years, *Answer.*

In selling a freehold estate at 8 per cent. how many purchase does it bring?

*Answer* 12 $\frac{1}{2}$ .

C A S E.

## C A S E 5.

The years' purchase given, to find the ratio;

## R U L E.

By the years' purchase divide the same more 1, and the quotient will be the ratio.

## E X A M P L E S.

1 Bought a ground rent for 15 years' purchase; what rate per cent. was allowed in this contract?

15) 16.00 (1.0666, &c. =  $6\frac{2}{3}$  per cent. *Answer*

2 What rate of interest is allowed in selling a perpetuity at 20 years' purchase? *Answer* 5 per cent.

3 A yearly income of 7*l.* per annum for ever being sold for 105*l.* at what rate of interest, and for how many years' purchase, was it? *Answer.*  $6\frac{2}{3}$  per cent. and 15 years.

## PERPETUITIES IN REVERSION.

## C A S E 1.

**T**HE rent of a freehold estate, time of reversion, and rate per cent. given, to find the present worth;

## R U L E.

Multiply the ratio involved to the time of reversion, by the ratio, less one, for a divisor; by which divide the yearly payment, and the quotient will be the present worth.

## E X A M P L E S.

1 Suppose a freehold estate of 60*l.* per annum, to commence 2 years hence, be put up to sale; what is the value, allowing the purchaser 6 per cent?

$$1.06 \times 1.06 \times .06 = .067416$$

*£. £. s. d.*

$$.067416) 60. (889 \text{ } 19 \text{ } 11 \text{ } \textit{Answer.}$$

2 What is an estate of 290*l.* per annum, to continue for ever, but not to commence till the expiration of 4 years worth in present money, allowance being made at 4 per cent? *Answer* 6197*l.* 6*s.* 7*d.*  $\frac{1}{4}$

## C A S E 2.

The present worth of a perpetuity, time of its reversion, and rate per cent. given, to find the yearly payment;

## R U L E.



## R U L E.

The continual product of the present worth, the ratio involved to the time of reversion, and the ratio, less one, will be the salary.

## E X A M P L E S.

1 A freehold estate is bought for 889.9965*l*. which does not commence till the end of 2 years; the purchaser being allowed 6 per cent. for his money; what was the yearly income?

$$\begin{array}{l} \text{Present worth } 889.9965 \\ 1.06 \times 1.06 \times .06 = .067416 \end{array} \left. \vphantom{\begin{array}{l} 889.9965 \\ 1.06 \times 1.06 \times .06 = .067416 \end{array}} \right\} \text{multiplied.}$$

£. 60 Answer.

2 There is a freehold estate bought for 6197*l*. 6*s*. 7*d*. $\frac{1}{2}$  which does not commence till the expiration of 4 years; the buyer was allowed 4 per cent. for his money; what was the yearly income?

*Answer* £. 290.

## LIFE ANNUITIES.

**A** NNUITIES for lives are estimated by probabilities drawn from the usual period of human life, according to observations made by men of eminence on regular bills of mortality.

*Construction of the following Table.*

With the rate per cent. and complement of the given age to 86 take a number from table IV multiply it by the ratio, and take the product from the said complement for a dividend; multiply the complement by the ratio less one for a divisor: the quotient will be the tabular number.

*Example.*—To find the tabular number for 50 years at 5 per cent.

86—50=36, which in table IV, with 5 per cent.  
give 16.5468

$$\begin{array}{r} 16.5468 \\ \times 1.05 \\ \hline 36 \quad 17.3741407 \\ .05 \quad 36 \end{array} \left. \vphantom{\begin{array}{r} 16.5468 \\ \times 1.05 \\ \hline 36 \quad 17.3741407 \\ .05 \quad 36 \end{array}} \right\} \text{subtract}$$

$$1.80 \quad 18.6258610 \quad 3477 \text{ Facit}$$

T A B L E

TABLE VI. Value of 1l. annuity, for a single life.

Age.	3 p. ct.	3½ p. ct.	4 per ct.	4½ p. ct.	5 p. ct.	6 p. ct.
9 or 10	19,87	18,27	16,88	15,67	14,60	12,80
8 or 11	19,74	18,16	16,79	15,59	14,53	12,75
7 or 12	19,60	18,05	16,64	15,51	14,47	12,70
6 or 13	19,47	17,94	16,60	15,43	14,41	12,65
5 or 14	19,33	17,82	16,50	15,35	14,34	12,60
4 or 15	19,19	17,71	16,41	15,27	14,27	12,55
3 or 16	19,05	17,59	16,31	15,19	14,20	12,50
2 or 17	18,90	17,46	16,21	15,10	14,12	12,45
1 or 18	18,76	17,33	16,10	15,01	14,05	12,40
9 or 19	18,61	17,21	15,99	14,92	13,97	12,35
8 or 20	18,46	17,09	15,89	14,83	13,89	12,30
7 or 21	18,30	16,96	15,78	14,73	13,81	12,20
6 or 22	18,15	16,83	15,67	14,64	13,72	12,15
5 or 23	17,99	16,69	15,55	14,54	13,64	12,10
4 or 24	17,83	16,56	15,43	14,44	13,55	12,00
3 or 25	17,66	16,42	15,31	14,34	13,46	11,95
2 or 26	17,50	16,28	15,19	14,23	13,37	11,90
1 or 27	17,33	16,13	15,04	14,12	13,28	11,80
9 or 28	17,16	15,98	14,94	14,02	13,18	11,75
8 or 29	16,98	15,83	14,81	13,90	13,09	11,65
7 or 30	16,80	15,68	14,68	13,79	12,99	11,60
6 or 31	16,62	15,53	14,54	13,67	12,88	11,50
5 or 32	16,44	15,37	14,41	13,55	12,78	11,40
4 or 33	16,26	15,25	14,22	13,30	12,56	11,25
3 or 34	15,67	14,71	13,82	13,04	12,33	11,05
2 or 35	15,29	14,34	13,52	12,77	12,09	10,90
1 or 36	15,05	14,16	13,36	12,63	11,96	10,80
9 or 37	14,84	13,98	13,20	12,48	11,83	10,70
8 or 38	14,41	13,59	12,85	12,18	11,57	10,45
7 or 39	13,96	13,20	12,50	11,87	11,29	10,25
6 or 40	13,49	12,78	12,13	11,54	10,99	10,00
5 or 41	13,01	12,36	11,74	11,19	10,68	9,75
4 or 42	12,51	11,92	11,34	10,82	10,35	9,45
3 or 43	12,00	11,45	10,92	10,44	9,99	9,20
2 or 44	11,46	10,95	10,47	10,04	9,63	8,85
1 or 45	10,90	10,44	10,01	9,61	9,24	8,55
9 or 46	10,32	9,91	9,52	9,16	8,83	8,20
8 or 47	9,73	9,36	9,01	8,69	8,39	7,80
7 or 48	9,11	8,79	8,48	8,19	7,93	7,40
6 or 49	8,46	8,19	7,92	7,67	7,43	6,95
5 or 50	7,79	7,56	7,33	7,12	6,91	6,50
4 or 51	7,10	6,91	6,75	6,54	6,36	6,00
3 or 52	6,38	6,22	6,06	5,92	5,77	5,50
2 or 53	5,63	5,51	5,38	5,26	5,15	4,90
1 or 54	4,85	4,77	4,66	4,57	4,49	4,30
9 or 55	4,05	3,98	3,91	3,84	3,78	3,65
8 or 56	3,21	3,16	3,11	3,07	3,03	2,95
7 or 57	2,34	2,31	2,28	2,26	2,23	2,15

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## C A S E 1.

To find the present worth of an annuity for a single life of a given age;

## R U L E.

Multiply the value of 1*l.* for the given age and rate of interest, in table VI. by the annuity.

## E X A M P L E S.

1. What sum should a person of 50 years of age give for an annuity of 100*l.* per annum, during his life, reckoning interest at  $4\frac{1}{2}$  per cent?

Tabular number,  $1082 \times 100 = 1082$  £. *Answer*

2. A merchant who married a widow of 40, would sell her jointure of 300*l.* a year for ready money; what should it bring at  $3\frac{1}{2}$  per cent?

*Answer* £. 4194

3. What is the present worth of 500*l.* per annum, to commence at the decease of a person who is now sixty years of age and to continue for ever after, computing at 5 per cent?

*Answer* £. 5805

## C A S E 2.

To find the value of an annuity for the joint continuance of two lives, one life failing, the annuity to cease?

## R U L E.

Multiply the product of the 2 tabular numbers for the given ages by the ratio less one, and deduct this result from the sum of those numbers for a divisor; multiply the said product by the annuity for a dividend, the quotient will be the value required.

## E X A M P L E S.

1. What is the value of 70*l.* annuity for the joint lives of 2 persons, one of 40 and the other of 50 years of age reckoning interest at 5 per cent?

$$11.83 \times 10.35 = 122.4405$$

.05

$$\hline \phantom{11.83} \times 70$$

$$6.122025$$

$$11.83 + 10.35 = 22.18$$

$$\hline 16057975 \quad 8570.835 \quad (533.7 \text{ £. } \textit{Ans.}$$

2. What

2 What is 100*l.* annuity worth for the joint lives of 2 persons of the age of 30 years each, at 4 per cent?

*Answer* 1039*l.*

## C A S E 3.

To find the value of an annuity upon the longest of 2 lives; that is to continue as long as either of the persons shall be living;

## R U L E.

Subtract the value of the joint lives (found by case 2d.) from the sum of the values of the single lives, the remainder will be the value sought.

## E X A M P L E S.

1 What is the value of 70*l.* annuity for the longer life of 2 persons whose ages are, one 40, the other 50 years, in 5 per cent?

$$11.83 + 10.35 = 22.18$$

70

---


$$1552.60$$

$$\text{Joint lives} = 533.7, \text{ per case 2d.}$$

---


$$\text{Answer } 1018.91.$$

2 What is 100*l.* annuity worth at 4 per cent. to continue during the lives of two persons whose ages are 30 and 40 years?

*Answer* 1826*l.*

## C A S E 4.

To find the value of an annuity for the time which a person of a given age may happen to survive another whose age is also given;

## R U L E.

From the value of 1*l.* for the proposed successor's life, subtract the value thereof for his and the possessor's joint lives, and multiply the remainder by the annuity, for the present worth.

## E X A M P L E S.

1 A enjoys an income of 100*l.* per annum; and B would purchase it for his life after A's death; what is B's chance

Q

chance worth reckoning interest at 5 per cent. their ages being, A 60, B 25?

1*l.* for B's life, table VI. 13.46

The joint value of 1*l.* 6.97, by case 2d.

$$6.49 \times 100 = 649*l.* \text{ Answer.}$$

2 A gentlewoman of 54 years of age possesses an estate worth 20*l.* per annum clear, which, at her death, falls to her son, who is now 25, if he shall be then living; what is the value of his expectation, at 5 per cent?

*Answer* 113.2*l.*

Note. Other cases might be added, but these adduced are the most useful, and will perhaps be sufficient.

## ALLIGATION.

**A**LLIGATION is a rule for adjusting the  
simples of compound quantities.

### CASE 1.

When several simple quantities, are  
given, and a mean price of any part of the  
quired.

### R U L E.

As the sum of the several quantities,  
Is to their total value;  
So is any part of the composition,  
To its value.

### E X A M P L E S.

1 If 19 bushels of wheat at 6*s.* the bushel, 40 of rye at 4*s.* and 12 of barley at 3*s.* be mixed together; what is a bushel of this mixture worth?

B. s.

19 at 6 = 114

40 at 4 = 160

12 at 3 = 36

—

— s. d.

71 ) 310 ( 4  $\frac{1}{2}$  *Answer.*

2 A grocer mixed sugars; 2*C.* wt. at 56*s.* 1*C.* wt. at 43*s.* and 2*C.* wt. at 50*s.* per *C.* wt. what is 3*C.* wt. of this mixture worth?

*Answer* 7*l.* 13*s.*

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7-9 4

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